BALLARD MINE SHOP CLOSURE MEMORANDUM

DRAFT FINAL – REV1

Ballard Shop

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Prepared by:

MWH, now part of Stantec

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ACRONYMS

AOC/CO	Administrative Order on Consent/Consent Order
ANFO	Ammonium Nitrate/Fuel Oil
ARAR	Applicable, Relevant, and Appropriate Requirement
A/T	Agencies and Tribes
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
COEC	Contaminant of Ecological Concern
e.g.	*exempli gratia* (Latin, for example)
FS	Feasibility Study
GRA	General Response Action
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
IDEQ	Idaho Department of Environmental Quality
i.e.	*id est* (Latin, that is to say; in other words)
LUC	Land Use Control
LTM	Long-Term Monitoring
MBW	Borehole Monitor Well
MCL	Federal Drinking Water Maximum Contaminant Limit
MDL	Method Detection Limit
MEK	2-butanone
MNA	Monitored Natural Attenuation
MW	Monitor Well
MWH	MWH Americas, Inc. (formerly Montgomery Watson Harza, Inc. now part of Stantec)
NOAEL	No Adverse Effects Level
O&M	Operations and Maintenance
OU	Operable Unit
P4	P4 Production, L.L.C.
PCB	Polychlorinated biphenyls
PCE	Tetrachlorethene

ACRONYMS (continued)

PCL	Preliminary Cleanup Level
RA	Remedial Action
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
ROD	Record of Decision
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SB	Soil Boring
SPCC	Spill Prevention, Control, and Countermeasures Plan
SVE	Soil vapor extraction
SVOC	Semi-Volatile Organic Compound
TMP	Temporary Monitoring Point
TPH	Total Petroleum Hydrocarbons
Tribes	Shoshone-Bannock Tribes
TCE	Trichlorethene
TCA	Tricholoethane
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Ballard Mine Shop Closure Memorandum (i.e., Closure Memo) has been prepared to describe the general closure process for the Ballard Mine Shop area (the Ballard Shop) following its use during the Ballard Mine Site (the Site) remedial action (RA). The final remedy for the Ballard Shop cannot be completed at this time because this area of the Site will continue to be used for a variety of purposes during the Ballard Mine Site-wide RA (Ballard Site RA) and potentially after the Site remedy is in place. Most notably, during the Ballard Site RA, the Ballard Shop will continue to be used for equipment staging area, refueling, and light maintenance. As a result, it was deemed necessary by the Agencies and Tribe (A/Ts) that the Ballard Shop should become a separate Operable Unit (OU) within the Ballard Site.

Given this situation, closure of the Ballard Shop OU will be conducted in two major steps. The first step begins with interim measures implemented to protect worker and public safety as described in this Closure Memo, while performing the Ballard Site RA. The second step will be a final investigation and closure of the Ballard Shop OU when the Ballard Site RA is completed, and activities related to construction of the final remedy have ceased at the Site in 6 to 8 years (this excludes long-term monitoring [LTM]).

A targeted post-RA Ballard Shop OU investigation likely will be needed to: 1) confirm that soil and groundwater contamination is present and is still of concern (given the natural degradation process of hydrocarbons) and 2) potentially investigate other activities (e.g., the fuel storage) that were performed during the Ballard Site RA following review of P4 records and a visual survey. Once a workplan has been prepared and the investigation activities are completed, a Focused Feasibility Study (FS) will be prepared to determine if cleanup actions are necessary within the Ballard Shop OU.

This Closure Memo provides the general framework for the incremental closure of the Ballard Shop OU in steps, and is organized as follows:

- Section 1.0 – Summarize the Ballard Shop OU background information; the 2011 Shop Area investigation and findings; the nature and extent of low-level organic constituents found in soil and groundwater; and the associated risks presented to human receptors and the environment from the identified constituents.

- Section 2.0 – List potential viable technologies and develop possible alternatives for the remediation of the contaminated media that can be considered in the future Focused FS.
- Section 3.0 – Discuss uses of the Ballard Shop OU during the overall Ballard Site RA and measures that will be implemented to protect human health and the environment during that time period.
- Section 4.0 – Present a possible closure remedy for the Ballard Shop OU following the Focused FS.

This Closure Memo, in combination with the *Ballard Feasibility Study Memoranda* (MWH, 2016 and 2017), will be used to describe the preferred remediation process for the Ballard Site, including interim measures for the Ballard Shop OU, that will be summarized in the Proposed Plan and Record of Decision (ROD) prepared for the Site.

This document has been prepared by MWH, now part of Stantec, on behalf of P4 Production, LLC (P4), in accordance with the requirements of the Administrative Settlement Agreement and Order on Consent/ Consent Order for Remedial Investigation/Feasibility Study (2009 AOC/CO; USEPA, 2009). The 2009 AOC/CO is a voluntary agreement between P4 and the United States Environmental Protection Agency (USEPA), the Idaho Department of Environmental Quality (IDEQ), the United States Department of Agriculture, Forest Service, the U.S. Department of the Interior, Bureau of Land Management, and the Shoshone-Bannock Tribes (Tribes), collectively referred to as the "Agencies and Tribes" or A/Ts.

1.1 Background

The Ballard Shop OU is located in the southwest corner of the Ballard Site as shown on **Figure 1-1**. The Shop building itself was operated as a maintenance shop/garage for heavy trucks and mining equipment from approximately 1952 to 1989 for both the Ballard and Henry Mines. Historical Shop operations included routine maintenance of the mining operation's vehicles and equipment (e.g., oil and other fluid changes, overhauls, and welding). Organic materials that may have been associated with the activities conducted in the Ballard Shop OU include motor oil, grease, transmission fluids, hydraulic fluids, diesel fuel, gasoline, and degreasing solvents.

The main Shop building is built on a concrete foundation and has a concrete floor with dimensions of approximately 120 feet by 120 feet. The Shop building contains both a former grease pit (now

filled in) and grated floor sump (refer to **Figure 1-2** for approximate locations within the building). The Shop building is accessed through bay doors located on the east and west sides of the building (refer to **Figure 1-2**). An unused office building was located southwest of the Shop building. However, the office building had fallen into such disrepair that it was no longer usable and was removed along with one small shed.

Transformers are present in two locations in the Ballard Shop OU. As shown on **Figure 1-2**, three historical transformers were located on an elevated platform just south of the Shop building. In addition, to the west of the Shop building, another larger transformer is located on a fenced, concrete pad. There has been some limited sampling of the large transformers located on the pad to the west of the Shop building. As of 1995, the polychlorinated biphenyls (PCB) levels were very low to not detectable in the transformer oils. However, there was no historical information on the three elevated transformers prior to the 2011 investigation discussed below.

Three underground storage tanks (USTs) were located northwest of the Shop building (refer to **Figure 1-2**). Two of USTs stored 3,000 and 4,000 gallons of oil and the third tank stored 4,000 gallons of gasoline. These USTs were closed in October 1991 under the State of Idaho UST program (IDEQ, 1991). As part of the UST closure, total petroleum hydrocarbons (TPH) contamination was discovered. The TPH contamination was likely a result of surficial spills during refueling operations and underground pipe leakage. The contamination was found to extend out horizontally from the north side of the Shop building in a pattern approximately 100 feet wide, 57 feet long and nine feet deep (Ankrum, 1992) as depicted on **Figure 1-2**. As approved by IDEQ, the contaminated soil was excavated in 1992 and land farmed until TPH levels were below established IDEQ cleanup goals. The Shop UST site was closed January 8, 2003 according to the IDEQ website (http://www2.deq.idaho.gov/waste/ustlust/Pages/FacilityInfo.aspx?id=3575)

Crushed slag also has been stockpiled in the Ballard Shop OU. This stockpiled slag (refer to **Figure 1-2**) has been used for maintenance on haul roads and associated facilities consistent with accepted uses on P4's plant site and other P4 facilities per the 1996 P4 Soda Springs Plant's AOC as discussed in Section 1.3.2. The size of the southern pile shown on **Figure 1-2** has steadily decreased in recent years, and it is anticipated that slag will not be stored there in the future.

Since the Henry Mine closure in 1989, the Ballard Shop has been used intermittently by P4 and its mining contractor, N.A. Degerstrom, to store vehicles, construction and maintenance materials, and other miscellaneous items. There also are several small sheds (both open and closed) around the

Ballard Shop that are used to store drill core, reclamation equipment, flammable materials and other miscellaneous items. The Shop building and immediate area were used for temporary construction offices during the initial setup of mining at the nearby Blackfoot Bridge Mine (i.e., until 2013), and currently is used as a staging area for mine supplies. To support the Blackfoot Bridge operations, a modular mine office building was constructed in 2014 on undisturbed P4 land approximately 1500 feet to the southeast of Shop, adjacent to the Blackfoot River Road. This office complex now is used as the primary office for Blackfoot Bridge Mine field operations.

Other new facilities in the Ballard Shop OU used to support the Blackfoot Bridge Mine (approximately 2 miles to the southwest) include several new above-ground fuel tanks and chemical storage areas that were positioned in late 2015 and into 2016 as depicted on **Figure 1-2**. These include, on the southwestern corner of the Ballard Shop OU, a bulk oil storage trailer, three 10,000-gallon tanks of off-road diesel, one 10,000-gallon tank that is partitioned and holds road diesel and gasoline (5,000 gallons each), and two 4,000-gallon used oil tanks. An additional new fuel storage area also is located directly east of the Shop building and includes secondary containment of the fuel stored in above-ground tanks therein. There also are two powder magazines for storage of explosives on the northwestern corner of the Ballard Shop OU and three ammonium nitrate/fuel oil (ANFO) trailers on the southeastern corner. It is noted that the current and future uses of the Ballard Shop OU are under P4's stringent health and safety, and environmental reporting requirements as detailed in their *Spill Prevention, Control, and Countermeasures Plan (SPCC) – Enoch Valley and Blackfoot Bridge Mine* (N.A. Degerstrom Inc., 2016). As such, any significant spills of chemicals (e.g., fuel) will be documented, reported, and remediated if necessary under the requirement of ongoing operations. It is also noted that the fuel farm at the Ballard Shop OU is underlain by a geosynthetic barrier, which precludes the downward migration of spilled fuel. As part of the final closure of the Ballard Shop OU, records for these new storage areas will be reviewed to assess if spills have occurred and measures that were taken to avoid environmental releases. In addition, upon removal of the structures, a visual assessment of the area will be conducted to identify potential areas of releases (e.g., soil staining). Depending on those reviews and visual assessments, addition investigations may be necessary prior to closure of the Ballard Shop OU.

1.2 Ballard Shop Investigation

An investigation was conducted in July 2011, throughout the Ballard Shop area (**Figure 1-2**) to investigate the possible contamination sources identified above (excluding the storage tanks and

other locations installed in the Shop Area since 2011). The approved *Ballard Mine Shop Investigation Sampling and Analysis Plan - Final Revision 2 (Ballard Shop SAP;* MWH, 2011b*)* included as Appendix D-2 of the *P4 Sites RI/FS Work Plan - Final Revision 2* (*RI/FS Work Plan*; MWH, 2011a) was followed during the investigation. The investigation was performed as part of the characterization of P4's three historical phosphate mines (i.e., the Ballard, Henry, and Enoch Valley Mines") in southeastern Idaho.

The Ballard Shop investigation included 11 boreholes with 20 soil samples (including duplicates), and six groundwater samples from three temporary monitoring points (TMPs) and two existing monitoring wells around the main Shop building (**Figure 1-2**). The locations were analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) or PCBs depending on the location of the boring. The investigation and investigation results are summarized below and in the Appendix B - *Ballard Mine Shop Area Investigation, Ballard Mine Remedial Investigation Technical Memorandum (Ballard Shop Investigation Tech Memo*; MWH, 2014b), which is attached as Appendix B to the *Ballard Mine Remedial Investigation Report* (*Ballard RI Report;* MWH, 2014a).

1.3 Nature and Extent of Contamination and Risk Summary by Medium

The Ballard Shop OU was investigated primarily to assess the potential for upland soil and groundwater contamination sources associated with organic compounds used and stored during its operating history as a maintenance facility. It also contains slag piles with known inorganic and radionuclide contaminants of concern (COCs). Below we discuss the soil and groundwater sampling results and the risk assessment associated with the results as described in the *Ballard RI Report* and Appendices A and B of the *Ballard RI Report*.

1.3.1 Soil - Nature and Extent and Risk Summary

Several VOCs and SVOCs were detected in the Ballard Shop OU soil (see **Table 1-1**). Most of the detected compounds are solvents that likely originated from degreasing and cleaning activities in the Ballard Shop . At this time, samples have not been collected from beneath the main Shop building foundation and slab. Hydrocarbons associated with fuel were not detected in any significant concentrations. The concentrations of organic compounds detected are well below screening levels as discussed below.

Detected concentrations of compounds in SB-01, SB-02 and SB-03 only exceeded the reporting limit (RL) for a few compounds including: 1,2,4-trimethylbenzene and 1,3,5- trimethylbenzene in SB-01 at 8 to 9 feet below ground surface (bgs). Soil boring SB-02 has a low-level detection of 1,1,1-trichloroethane at approximately twice the method detection limit (MDL) in the soil sample collected from 4 to 5 feet bgs. In both SB-01 and SB-02, the detections were below the RL in the deeper soil sample (15 to 16 feet bgs in SB-01 and 9 to 10 feet bgs in SB-02). Soil boring SB-03 had a low-level detection of acetone in both the 13 to 14-foot bgs and 22 to 23-foot bgs samples at 61.1 and 66.3 μg/kg, respectively. However, these concentrations are well below the screening level for acetone (61,000,000 μg/kg). The compound 2-butanone (MEK) also was detected in the 22 to 23-foot bgs sample of SB-03 at a low concentration (12.1 μg/kg). This concentration is several orders of magnitude below screening levels.

The concentrations of organic compounds in soil boring SB-04 were somewhat higher than SB-01 through SB-03, but still well below screening criteria. Chemicals with concentrations above the RL in the 10 to 11-foot bgs soil sample were 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-butanone, acetone, and cis-1,2-dichloroethene (**Table 1-1**); with the exception of cis-1,2-dichloroethene, concentrations were below the RL in the 18 to 19-foot bgs sample.

The number of compounds detected in step-out borings SB-08, SB-09 and SB-10 were higher than SB-04, but all again are well below screening criteria (**Table 1-1**). Concentrations generally decreased with depth and were generally lower in SB-10. Several VOCs were detected including the following subset: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylenes, ethylbenzene, n-butylbenzene, n-propylbenzene, and p-isopropyltoluene. In addition to the VOCs detected, several SVOCs were detected above the RLs including: 2-methylnaphthalene, acenaphthene, fluorene, naphthalene, phenanthrene, and pyrene (**Table 1-1**), but again, all these concentrations are well below screening levels.

Soil boring SB-11 was advanced on the east side of the shop building to verify the observations in SB-02. Chemical concentrations in the soil from this boring also were below their corresponding RLs with the exception of low concentrations of 1,1,1-trichloroethane (12.9 μg/kg maximum at a depth of 5 to 5.5 feet bgs).

Borings SB-05 and SB-06 were advanced to investigate the potential for PCB contamination in the soils underlying historical transformer locations. The PCB laboratory RLs and screening levels were presented in the Ba*llard Shop SAP* and used for evaluations in the *Ballard Shop Investigation Tech Memo*.

No PCBs were detected at concentrations above their corresponding RLs in soils collected from either boring location.

Due to the low-level soil concentrations of VOCs, SVOCs, and PCBs around the exterior of the Shop building (currently below USEPA Regional Screening Levels [RSLs; USEPA, 2017]) and limited groundwater detections, it is not suspected that significant contamination exists beneath the building pad. However, if the Shop building and pad is demolished, then a visual assessment will be performed. An appropriate response will be developed if the presence and extent of contamination is confirmed as described in Section 4.0.

Soil Risk Summary

The individual-constituent laboratory-reported RLs for all samples collected, analyzed, and reported in the *Ballard Shop Investigation Tech Memo* are well below their individual USEPA RSLs. Risks associated with organics in media at the Ballard Shop OU were calculated and documented in the *Baseline Risk Assessment Report for the Ballard Mine and Ballard Shop* (*BRA*; MWH, 2014c), provided in Appendix A of the *Ballard RI Report*. The risks are summarized below.

- **Human Health Risk** - Site-related carcinogenic risks to hypothetical future residents from naphthalene in indoor air following assumed vapor intrusion from Shop soil (into a hypothetical house installed over the contamination) are in excess of IDEQ's criteria of 1 x 10-5 but fall within USEPA's risk management range of 1 x 10-4 to 1 x 10-6, under the Tier II RME scenario (**Table 1-2**). The acceptable non-cancer hazard index (HI) of 1 is exceeded for the Tier II RME scenario for 1,2,4-trimethylbenzene (a hazard quotient [HQ] of 5) again in indoor residential air following assumed vapor intrusion from Ballard Shop OU soil.

- The residential air risk from naphthalene in soil is well within the USEPA's risk management range and is not considered a final COC when evaluating closure technologies and alternatives in Section 2.0 and proposed final closure remedy in Section 4.0. The slight excess residential indoor air risk due to 1,2,4-trimethylbenzene is driven by a single detection in SB-09 at a depth of 5 to 6 feet bgs (9,820 μg/kg). However, concentrations of these organic compounds in shallow soil, and other detected organic compounds, including petroleum hydrocarbons, are well below residential risk-based screening levels (e.g., screening level for 1,2,4-trimethylbenzene is 58,000 μg/kg). Concentrations of naphthalene and 1,2,4-trimethylbenzene are shown on **Figure 1-3**.

- Given the land ownership and industrial nature of the Ballard Shop OU, and its continued industrial land use to support P4 mining operations, the potential for residential land use is unlikely to occur. As a result of the land use, isolated low-level detections, and low hypothetical future residential risk estimates, no organic COCs in soil warrant consideration in the brief evaluation of technologies and alternatives discussed in Section 2.0.
- **Risk to the Environment** - A No Adverse Effects Level (NOAEL)-based Tier II HQ estimate in excess of 1 was calculated for the long-tailed vole at the Ballard Shop OU. The primary risk driver is 1,2,4-trimethylbenzene, and the hazard estimate is 2.3. NOAEL-based Tier I HQ estimates for other indicator species (American Goldfinch, American Robin, and Deer Mouse) were below 1 and not carried forward into the Tier II ecological assessment (risk calculations are presented in the *BRA*). As discussed above for the human health risk assessment, the excess ecological HQ for 1,2,4-trimethylbenzene is driven by a single detection at a depth of 5 to 6 feet bgs, and the ecological hazard associated with this detected concentration are relatively low. Additionally, although a burrowing animal such as a deer mouse might encounter subsurface soil at a depth of 5 to 6 feet below ground surface, such exposure is likely to be less common than surface exposures. As a result, no organic contaminants of ecological concern (COECs) in soil warrant consideration in the brief evaluation of technologies and alternatives discussed in Section 2.0.

1.3.2 Slag – Location and Risk Summary

As discussed above, crushed slag is stockpiled at the Ballard Shop OU (refer to **Figure 1-2**). Also, over much of the Ballard Shop OU, the original ground surface is covered in slag that was placed early in the Shop's operation and continually when needed during the Shop operation. Based on the boring logs, the depth of slag over the ground surface ranged anywhere from two to 10 feet bgs. As part of the Human Health Risk Assessment (HHRA) for the P4 Plant Site (Montgomery Watson, 1996), the USEPA evaluated chemical and radiological on-site risks to industrial workers (worker risk) within the operating portion of the Plant from exposure to uncontrolled releases of hazardous substances including slag. Specifically, the Plant Site HHRA evaluated current and future industrial worker exposure via incidental ingestion, external radiation, and inhalation.

The HHRA concluded that no uncontrolled releases were identified at the plant site that posed unacceptable threats to workers' health or safety under current conditions (USEPA, 1997). As a

result, when preparing the FS for the P4 Plant Site (Montgomery Watson, 1996), no additional remedy considerations were given to the use of slag at the plant. Because of the similarity of the Ballard Shop OU and the P4 Plant Site (industrial, occasional worker exposures when near the slag piles, etc.), it is assumed that slag risks are also minimal at the Ballard Shop OU. In addition, P4 will reduce the final slag pile size, but continue to use slag, and this location, for storage of road maintenance slag material.

1.3.3 Groundwater - Nature and Extent and Risk Summary

The potentiometric surface in the shallow alluvial aquifer beneath the Ballard Shop OU was monitored in the three temporary monitoring wells (SB-01, SB-03 and SB-07) and two existing area wells (MW-15A and MBW011). The depth to groundwater as observed in the borings is approximately 30 to 35 feet below the ground surface. The potentiometric contours are depicted in **Figure 1-4** for July and November 2011. These data indicate a southwest to a west-southwest groundwater flow direction beneath the Ballard Shop OU. This was the flow direction predicted based on the topography and the general conceptual model for alluvial groundwater flow at the Ballard Site as presented in the *RI/FS Work Plan* and *Ballard Shop SAP* (MWH, 2011a & b, respectively).

The most notable difference between the early summer and late fall groundwater data is that the potentiometric gradient is steeper in the early summer (0.044) when compared to the late fall (0.025) presumably consistent with the spring recharge event. Hydraulic conductivity testing results from monitoring wells MW-15A and MBW011 indicated hydraulic conductivities in the alluvium near the Ballard Shop of 0.4 to 1 feet/day, respectively (MWH, 2011a). This translates to an average linear flow velocity in the Ballard Shop area ranges from approximately 0.04 to 0.2 feet/day (15 to 64 feet/year) assuming an effective porosity of 0.25. Because of attenuation (compound sorption and degradation), the actual transport velocity is likely less than the calculated average linear velocity.

Seven volatile compounds were detected in groundwater above their corresponding MDLs in the TMPs as shown in **Table 1-3**. Trichloroethene (TCE), for example, was reported between the MDL and RL in SB-01 and SB-07. Only 1,1,1-trichloroethane (1,1,1-TCA in SB-03) and tetrachloroethene (PCE in SB-07) were detected above their RLs. The concentrations of 1,1,1-TCA in SB-03 (9.49 to 12.6 μg/L) were well below its Federal Drinking Water Maximum Contaminant Limit (MCL) of 200 μg/L. However, the concentration of PCE in SB-07 (6.98 μg/L) in 2011 was just above its MCL of

5 μg/L and in 2015 was detected at 13.2 μg/L as shown on **Figure 1-4**. The extent of PCE above the MCL near SB-07 has not been defined.

One semi-volatile compound was detected in groundwater. A concentration of 16.5 μg/L bis(2-ethylhexyl) phthalate was detected in groundwater collected from MBW011 in 2011. This concentration is above the screening level of 5.6 μg/L. However, MBW011 had no other detected concentrations of organic compounds and MBW011 is well away from any potential sources of organic contamination with the possible exception of the Ballard Shop OU. Bis(2-ethylhexyl) phthalate was not detected in any other soil or groundwater sample collected during the investigation. It was suspected that the detected concentration of bis(2-ethylhexyl) phthalate, which is a common plasticizer, is a field or laboratory contaminant, and is not associated with the groundwater at the Site. As a result, this location was resampled in 2014 and bis(2-ethylhexyl) phthalate was not detected above the RL (see **Table 1-3**) and as a result, this constituent was dropped as a potential Site contaminant.

Groundwater Risks Summary

- **Exceedances of Chemical-Specific ARARs** - Monitoring location (SB07) reported concentrations of PCE in groundwater above the groundwater standard (i.e., MCL) of 5 μg/L in 2011 and 2015 (6.98 and 13.2 μg/L). Given the current land ownership and continued industrial use of the Ballard Shop OU, future residential land use is unlikely. However, alternatives to address PCE above its MCL are discussed in Section 2.0. In addition, it should be noted that further groundwater characterization likely is needed prior to closure to further characterize the potential for a plume associated with the concentrations observed at the SB-07 location. At a minimum, this characterization would be needed to help ensure proper monitoring of the groundwater below the Ballard Shop OU. However, if significant additional contamination is found, additional analysis of risk and remedial alternatives may be needed.
- **Risk to Human Health** - Hypothetical fruits and vegetables grown in area soils and irrigated with groundwater from the Ballard Shop OU are within USEPA's acceptable cancer risk management criteria for TCE, as shown in **Table 1-2**. There are no other site-related risks to hypothetical future residents from organics in groundwater and currently the groundwater pathway is incomplete so there is no current human exposure.

- **Risk to the Environment** - There are no risks to the environment from groundwater because the groundwater pathway is incomplete for ecological receptors as there is no groundwater discharge to streams, springs, or ponds that could serve as wildlife water sources in the vicinity of the Ballard Shop OU.

2.0 VIABLE TECHNOLOGY REVIEW AND CLOSURE ALTERNATIVES

2.1 Introduction

General response actions (GRAs) describe those actions that will satisfy the Remedial Action Objectives (RAOs) for closure of the Ballard Shop OU. GRAs can include a wide variety of treatment, containment, excavation, extraction, and disposal technologies and institutional controls to reduce or eliminate human and ecological exposure pathways at the Ballard Shop OU. The specific remedial technologies or process options to be considered for the Ballard Shop OU remediation and closure vary depending on the medium to be treated (soil or groundwater in this case) and the site-specific/area-specific conditions.

Following the Ballard Site RA and use of the Ballard Shop OU during the RA, a future site investigation will be discussed and implemented, as necessary, followed by a focused FS that will review and if necessary, expand on the preliminary GRAs presented herein, depending on the results of the investigation. If deemed necessary, a focused FS will screen technologies and compare alternatives based on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) RI/FS Guidance (USEPA, 1988) criteria including effectiveness, implementability, and cost.

RAOs for the Ballard Shop OU soils and groundwater will be updated as necessary in the future Focused FS. These RAOs likely will be similar, if not the same as those provided in Table 3-5 of the *Ballard FS Memo #1* (MWH, 2016a) for the main Ballard Site. The Ballard Site RAOs strive to prevent or reduce human and ecological exposure to Site COCs/COECs and meet applicable, relevant, and appropriate requirements (ARARs).

The preliminary GRAs, the technologies used to implement the preliminary GRAs, and the potential alternatives developed for the Ballard Shop OU closure, only focus on those that are currently viable because of the:

- Limited number and spatial distribution of soil and groundwater COCs/COECs that are universally below the applicable screening levels (except for one exceedance of an MCL in groundwater)
- The low human and ecological risks

- The likely future land uses as discussed in Section 1.3.

The GRAs are preliminary until the Ballard Shop OU is no longer actively used, follow-up investigations are performed, and a Focused FS is prepared, as described in Section 1.0.

The preliminary Ballard Shop OU GRAs were developed specifically for the COCs/COECs identified in Section 1.3. The preliminary cleanup levels (PCLs) considered for these COCs/COECs are based on the following:

- Soil – State of Idaho Risk Evaluation Manual for Petroleum Releases Table A7-1 (IDEQ, 2012) and USEPA RSLs Residential Soil (USEPA, 2017) for any future investigations results as further discussed below.
- Groundwater – Federal Drinking Water Maximum Contaminant Level (MCL) for PCE.

For each of the soil and groundwater alternatives discussed below, initially the technologies considered for closure of the Ballard Shop OU are presented to set the stage for the development of preliminary closure alternatives. In Section 4.0, media-specific remedial alternatives from those listed below are presented to be considered further in a Focused FS for final Ballard Shop OU closure.

2.2 Preliminary Soil Technology Review and Closure Alternative Development

Applicable technologies considered for remediation of organic COCs/COECs in soil are organized by preliminary GRAs. The discussion below is narrowly focused on currently viable GRAs, suitable technologies, and the alternatives that result from this evaluation. A Focused FS, prepared following the Ballard Site RA, will expand upon the preliminary GRAs, suitable technologies and alternatives, as necessary, once the nature and extent of any contamination is defined in accordance with USEPA guidance (USEPA, 1988).

2.2.1 Alternative 1 - No Action

No action would leave the Site in its existing condition. No Action does not use any restrictions or technologies to further protect human health and the environment.

A No Action alternative for the Ballard Shop OU does not mitigate the future risks. Therefore, the No Action alternative is not protective of human health and the environment over the long term (e.g., during the Shop Building demolition), so it would not be chosen for the Site.

2.2.2 Alternative 2 - Limited Action Response – ICs/LUCs

The Limited Response Actions considered for affected soil include institutional controls (ICs - government controls that include local or state land use restrictions, proprietary controls that include deed restrictions or restrictive covenants, enforcement tools, and informational tools) and land use controls (LUCs - that can include fencing, signage, and other physical barriers). For example, a deed restriction could be placed on the main Shop building title that would require additional investigation and sampling beneath the Shop building slab if the building was demolished in the future and to prevent residential use.

Under Alternative 2, ICs and LUCs would be implemented that require appropriate planning, monitoring, and periodic evaluations to confirm protection of human health and the environment and to track progress toward meeting RAOs. ICs/LUCs would require preparation of an Institutional Controls Implementation and Assurance Plan (ICIAP), which typically requires legal support. The proprietary controls would be described in the ICIAP and may include deed restrictions or restrictive conveyance. Engineered LUCs (e.g., fencing or signage) would be installed and would require some construction, periodic inspection, and maintenance.

2.2.3 Alternative 3 - Removal, Disposal, and/or Reuse

Removal and disposal is a proven technology to reduce or eliminate risks posed by COCs/COECs detected in Shop Area soil and is applicable at sites with limited and shallow distribution of contaminants in underlying soil. For the Ballard Shop OU, by removing these materials and properly disposing of them, any source of COCs/COECs in soils would no longer be present to impact other Site soil and/or groundwater (i.e., removal of the contamination source). The removal and disposal technology and process most applicable to the Ballard Shop OU COCs/COECs is simple excavation, proper disposal, and replacement of the excavated soil with clean fill.

Based on the 2011 investigation, no Ballard Shop area soils exceed PCLs that would require excavation and disposal. However, future Ballard Shop OU actions could utilize this technology. For example, in the event that the Shop building is demolished, additional sampling beneath the

Shop building slab could be used to confirm that COCs/COECs are not present in the soil. Should contaminants be encountered at concentrations exceeding the soil PCLs, then excavation and disposal would be considered a viable option to remedy this problem. Under this scenario, impacted soil would be excavated using a backhoe to the depth of contamination (confirmed by soil sampling). Off-Site and On-Site disposal options would be evaluated and the soil properly disposed and imported clean fill would be used to backfill the excavation. A closure action work plan would include the necessary elements including necessary surveys (e.g., avian nest clearance) prior to building demolition, excavation depths, confirmation sampling protocols, site restoration plan, Health and Safety Plan (HASP), etc.

2.3 Preliminary Groundwater Technology Review and Closure Alternative Development

A single groundwater constituent, PCE, currently exceeds its MCL in groundwater collected from the Ballard Shop OU wells/TMPs as shown on **Figure 1-4**. Technologies considered for PCE remediation are listed below and organized by GRA similar to the soil medium. The discussion below is limited to currently viable GRAs, technologies, and alternatives developed for remediation of Ballard Shop OU groundwater. The technologies considered and potential alternatives developed are narrowly focused because of:

- The limited indication of PCE above its MCL in groundwater (based on the 2011 and 2015 sampling).
- The fact that PCE nor any other organic COC posed a human health risk based on the *BRA* risk estimates (MWH, 2014c). Ecological risks were not considered as there is not a complete exposure pathway from groundwater to surface water in the vicinity of the Ballard Shop OU.
- The unlikely possibility that the alluvial groundwater in the Ballard Shop OU will be used as drinking water source in the future.

2.3.1 Alternative 1 - No Action

No action would leave the Site in its existing condition. No Action does not use any methods or technologies to further protect human health and the environment.

A No Action alternative for the Ballard Shop OU does not address the groundwater contaminant PCE found in alluvial groundwater that exceeds its MCL so it would not be chosen for the Site.

2.3.2 Alternative 2 - Limited Action Response – MNA and ICs/LUCs

The Limited Action Response technologies and processes considered for Ballard Shop OU groundwater include Monitored Natural Attenuation (MNA), ICs, and LUCs. This Limited Action Response includes MNA that relies on natural attenuation processes to reduce COC concentrations in the Site's alluvial groundwater over time (see **Figure 1-4**), and ICs/LUCs to limit access and exposure to the alluvial groundwater during the MNA process as summarized below.

MNA – MNA is a USEPA-recognized limited response action that relies on natural attenuation processes like sorption and chemical transformation. In the case of PCE in the Ballard Shop OU groundwater, the dominant attenuation process would be reductive dechlorination. Application of MNA would be dependent upon demonstrating favorable chemical conditions for dechlorination including presence of microorganisms, redox conditions, and carbon sources. As noted in the 2011 groundwater sample results, several low-level degradation products of PCE also were detected (see **Table 1-3**) suggesting that degradation processes are currently active in the groundwater system.

Although this is a limited-action type response, this alternative would require appropriate planning, monitoring, and periodic evaluations to confirm protection of human health and the environment and to track progress toward meeting the RAOs. Proper planning and implementation would require a predesign/design study to demonstrate the effectiveness of MNA processes on the low-level organics detected in Ballard Shop OU groundwater. MNA requires no additional construction or operations and maintenance (O&M) other than that associated with the long-term monitoring (LTM) as described below.

LTM – Implementation of MNA would require preparation of a LTM SAP, baseline followed by routine groundwater monitoring, and periodic data evaluations to track the progress of natural attenuation and to support the CERCLA 5-year review process.

ICs – MNA would require ICs to restrict groundwater use until RAOs are achieved. Institutional controls would require preparation of an ICIAP, which typically requires legal support. It is anticipated that the ICs would include deed restrictions to limit alluvial groundwater extraction and use until the local alluvial aquifer is remediated. The implemented ICs would require periodic evaluation (e.g., during the CERCLA 5-year review process likely with the overall Ballard Mine Site

remedy) to confirm they remain adequate in relation to the nature and extent of COCs, and that they are being enforced and maintained.

LUCs – Land use controls for this groundwater alternative are limited. Signage would be used in strategic locations (e.g., on the Shop Building) indicating that if drilling and groundwater removal (or soil excavation) is needed in the Ballard Shop OU, it must be reported and cleared with the mine manager before proceeding. Fencing may be utilized for the Site but will have little effectiveness restricting subsurface groundwater exposure.

2.3.3 Alternative 3 - In-Situ Treatment

In-situ treatment can consist of the introduction of reagents to the subsurface to facilitate the destruction of the organic compounds within the aquifer. Three different general in-situ technologies exist for groundwater COCs/COECs in the Ballard Shop OU, notably for the chlorinated solvents such as PCE and its degradation products (Dukes, et al., 2005). These in-situ technologies include:

- Bioremediation (USEPA, 2013), which can consist of biosimulation or bioaugumentation
- Chemical oxidation
- Chemical reduction

To facilitate biologically-mediated reductive dechlorination of PCE and its degradation products, biosimulation typically includes the introduction of carbon sources, such as molasses, lactate, or vegetable oil emulsions. Bioaugumentation typically includes the introduction of the *Dehalococcoides ethenogenes* or similar bacteria along with the carbon sources. The in-situ chemical oxidation method destroys the chlorinated solvent using strong chemical oxidants, such as hydrogen peroxide or permanganate, injected into the contaminated groundwater, whereas the chemical reductive method uses a chemical reductant such as zero-valent iron or calcium polysulfide. The chemical reductant technology can have the added benefit of helping to stimulate biological reduction, which could extend the effective treatment period.

All three of these general in-situ remedial methods can be effective in reducing PCE to meet ARARs. The selection of the most effective method is highly dependent upon the aquifer physical and chemical characteristics. For example, if an aquifer is naturally reducing, reductive methods may be more effective compared to oxidative methods. Methods of application also will be highly

dependent upon the physical characteristics of the aquifer (e.g., hydraulic conductivity and depth of contamination). For the Ballard Shop OU, injection using direct-push methods is a probable application method, but injection wells or trenches also may be effectively used.

In-Situ treatment as an alternative includes active intervention to reduce the concentration of COCs in groundwater originating from the Ballard Shop OU. This would include the introduction of reagents to groundwater to facilitate the degradation of the COCs, focusing on PCE and its degradation products. Design of an effective in-situ treatment system would require additional data collection on the physical and chemical conditions of the affected aquifer during a pre-design study. Based on current knowledge of the contaminant distribution and aquifer characteristics, it is possible that in-situ bioremediation could be implemented at the Ballard Shop OU. Such a system would likely consist of direct-push injections of a carbon source (with or without bacteria) in three to five lines across a relatively narrow area perpendicular to the groundwater flow direction. These injection lines would in effect create reductive zones perpendicular to the contaminant flow direction. If the pre-design characterization indicates that chemical methods would be more effective, then that approach would be implemented, but likely would be similar to the bioremediation (i.e., similar spacing of injection lines and points). With chemical treatment, a reductive zone followed by an oxidizing zone can be utilized if destruction of PCE and its degradation products proves difficult.

LTM would be needed to evaluate the effectiveness of the injections. Multiple rounds of injections might be required to completely remediate the plume as the alluvial aquifer underlying the Ballard Shop OU is heterogeneous, which does not favor in-situ treatment. As a result, often there is rebound of contaminant levels in the groundwater following the initial injection.

Air sparging with or without soil vapor extraction (SVE) also is a potential technology for treatment of VOCs in shallow groundwater. However, this technology was rejected because of the depth to groundwater (30 to 35 feet) and the heterogeneous and layered alluvial stratigraphy, both of which limit the effectiveness of air sparging. Clay beds are common in the alluvial sequence, and the alluvial groundwater can be partially confined beneath these clay layers. As such, dispersion or extraction of injected air out of the saturated units would be impeded.

3.0 INTERIM SITE USE AND CONTROLS DURING REMEDIAL ACTION

3.1 Ballard Shop OU Uses During the Remedial Action

Currently, the Ballard Shop OU including the Shop building is not occupied full-time by on-site workers, but is used daily for

- Parking of personal vehicles and van transport to the Blackfoot Bridge Mine,
- Storage of vehicles/equipment/explosives,
- Fueling of P4 equipment and fuel storage
- Other infrequent activities that place workers in the Shop Area OU.

During the Ballard Site RA, uses for the Ballard Shop OU will be similar, but the scale of these activities will increase dramatically. The Ballard Shop OU will be used as a laydown yard for equipment and materials used to implement the selected Site remedy, for parking of project staff vehicles and equipment, and likely for continued storage of fuel for remediation equipment. A decision has not been made where the construction office buildings will be during the Ballard Site RA; they could be at the current Blackfoot Bridge location, although it might be more convenient to use the Ballard Shop OU for Ballard Site remediation staff. Interim control measures below address the measures that will be taken to control risks if office trailers are located in the Ballard Shop OU.

As discussed in Section 1.3.2, crushed slag is stockpiled at the Ballard Shop OU and has been used, and will continue to be used, on P4 lands for maintenance of haul roads and associated facilities' parking lots. Slag from the remaining stockpile at the Shop also will be used to construct or armor additional on-Site access roads during the Ballard Site RA.

3.2 Interim Control Measures

Interim Control Measures are actions that will be taken in the Ballard Shop OU during the period of time, assumed to be approximately 6 to 8 years depending on the Selected Remedy, when the Ballard Site RA is being implemented. For the Ballard Shop OU, ICs/LUCs are recommended to limit potential exposures, primarily to construction workers during the Ballard Site RA before the Ballard Shop OU is completely closed. In addition, groundwater monitoring should occur as part of the

LTM for the overall Ballard Site RA. The following are recommended interim ICs and monitoring programs to address risks identified in Section 1.3 until final closure occurs.

- Detected concentrations of 1,2,4-trimethylbenzene in upland soil sampled in the Ballard Shop OU could result in unacceptable risk to breathing indoor air following vapor intrusion. However, note this risk is for a hypothetical future resident, which would be restricted through the future use of ICs (e.g., deeds preventing residential use), and is not a risk for the occasional Site worker, whose exposure time would be much less.

  The recommended interim ICs to address this risk may include building restrictions to prevent indoor air exposure scenarios from occurring. For example, if a temporary Sprung Structure™ was constructed to prevent weather exposure to materials used for stormwater mitigation, like aspen fiber wattles, then the temporary structure would have to be monitored to determine if there were risks from vapor intrusion or if not monitored adequately, ventilated prior to entry. Similarly, if office trailers were located in the area of known soil contamination (i.e., near the Shop building) then areas enclosed by skirting would have to be monitored to determine if there are any risks to Ballard Shop OU workers or properly ventilated to prevent vapor intrusion.

- Detected concentrations of PCE in Ballard Shop OU monitoring well SB07 exceed its Federal Drinking Water MCL. The recommended IC to address risk from groundwater is to restrict its use. Therefore, groundwater extraction would be restricted through the use of ICs by prohibiting installation of alluvial wells that might be used for drinking water (unless they are installed into deeper aquifers and are constructed to eliminate water from the alluvial aquifer). Use of the alluvial aquifer underlying the Ballard Shop OU is of a minor concern because the limited yield from the alluvial aquifer makes it an unlikely source of drinking water.

- The LTM of all the P4 CERCLA Sites will continue and additional monitoring is recommended specifically in the Ballard Shop OU. Groundwater monitoring of TMPs SB-01, SB-03, SB-07, and MBW011 for VOCs/SVOCs should be conducted annually during the duration of the Ballard Site RA.

  Prior to beginning the LTM in the Ballard Shop OU, it will be necessary to perform a direct-push boring investigation to better define if there is a groundwater plume in the Ballard

Shop OU associated with SB-07, and to help determine the extent of the PCE. If the investigation findings warrant, it may be necessary to install additional permanent wells in strategic positions (e.g., the downgradient end of the plume) near the plume.

- Based on the risk assessment for slag at the P4 Plant Site (Montgomery Watson, 1996), no uncontrolled releases were identified which posed unacceptable threats to workers' health or safety under current conditions (USEPA, 1997). As a result, no additional interim considerations need to be given to construction worker exposure (due to slag) at the Ballard Shop OU or along on-Site roads.

4.0 CLOSURE REMEDY FOR THE BALLARD SHOP

4.1 Introduction

This section assembles preliminary media-specific alternatives identified in Sections 2.0 and 3.0 into a combined closure strategy. In addition, this closure remedy could change based on future uses of the Ballard Shop OU prior to final closure and additional characterization that likely will be conducted following the Ballard Site RA. It is important to note that the actual remedy for the Ballard Shop OU closure will be selected by USEPA based on additional investigation that may be necessary, further evaluation of Site conditions in a Focused FS, and additional input from the A/Ts.

4.2 Preliminary Closure Strategy and Remedy

The recommended preliminary combined remedy for the Ballard Shop OU includes the following medium-specific alternatives:

- Soil Alternative 2 – ICs/LUCs with contingency
- Groundwater Alternative 2 – ICs/LUCs/MNA with contingency

Soil - For final closure, ICs (e.g., restrictions on excavation in and around the Shop Building) and LUCs (e.g., signage) would be implemented to restrict excavation in Shop Area soils without proper worker safeguards and environmental monitoring (and sampling, if necessary). For areas of known or suspected soil contamination, this would include preparation of project-specific work plans, USEPA approval of those plans, and monitoring during excavation activities.

Soil Contingency - Prior to final Ballard Shop OU closure, the soil beneath the shop building slab may be investigated if it is determined by all parties to be necessary. This investigation may involve a systematic sampling of the underlying soils to the water table using soil borings if the pad is not demolished at closure, or test pits if the slab is removed and the underlying soils are exposed. Grab samples would be collected from any visible hot spots observed following slab removal (e.g., areas of staining). If future construction activities in the Ballard Shop OU encounter concentrations of organics (e.g., naphthalene and 1,2,4 trimethylbenzene) in subsurface soils (e.g., under Shop building slab during demolition) at levels that exceed PCLs then excavation, removal, and disposal of this soil would be considered. The impacted soil would be excavated to expose clean materials (i.e., below

the depth of contamination as confirmed by soil sampling). Off and on-Site disposal options would be evaluated, and the soils would be properly disposed. The excavation then would be backfilled with imported clean fill. If no contamination is found, then no further action would be taken.

Groundwater - For alluvial groundwater, drilling and the use of the alluvial groundwater would be restricted through the use of ICs/LUCs. Proper implementation of MNA would require a predesign/design study to demonstrate the effectiveness of MNA processes, an LTM SAP, routine groundwater monitoring, and periodic data evaluations to track the progress of natural attenuation and to support CERCLA 5-year reviews.

As discussed in this Closure Memo, any remedial actions in the Ballard Shop OU are proposed to be deferred until the area is no longer actively used. Therefore, it is recommended that ICs/LUCs and LTM as outlined in Section 3.0 be implemented as an interim measure to limit potential exposures until final closure occurs.

Groundwater Contingency – Immediately following or during the completion of the Ballard Site RA, an additional groundwater investigation will be completed to define the nature and extent of VOCs over screening levels. If the results of that investigation identify additional VOC concentrations exceeding screening levels, or an extensive area of PCE contamination, new risk calculations may be completed, and additional remedial technologies may be evaluated in a Focused FS that will be completed for the Ballard Shop OU.

4.3 Schedule for Implementation

The Ballard Shop OU will continue to be used for parking and storage of vehicles, equipment, fuel, and explosives, and this use likely will expand during implementation of the Ballard Site RA. It is anticipated that Ballard Site RA construction will begin within one to five years and will last for up to eight years. Following completion of the Ballard Site RA, P4's need for and use of the Ballard Shop OU to support future operations at their mines will be evaluated. Additional investigations of the Ballard Shop OU and development of a Focused FS as outlined in Section 1.0 of this Closure Memo will be performed at that time. Based on the investigation findings and Focused FS evaluation of alternatives, modifications may be necessary to these preliminary closure alternatives for soil and groundwater to accommodate P4's and A/Ts' needs and requests.

5.0 REFERENCES

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TABLES

TABLE 1-1
SOIL ANALYTICAL RESULTS
BALLARD SHOP AREA INVESTIGATION

Location Identification:		SB01	SB01	SB02	SB02	SB02 Dup	SB03	SB03	SB04	SB04	SB08
Field Sample Identification:		►SB01 (8 TO 9)	►SB01 (15 TO 16)	►SB02 (4 TO 5)	►SB02 (9 TO 10)	►SB02 (9 TO 10)-1	►SB03 (13 TO 14)	►SB03 (22 TO 23)	►SB04 (10 TO 11)	►SB04 (18 TO 19)	►SB08 (7 TO 8)
Date Collected:		7/26/2011	7/26/2011	7/26/2011	7/26/2011	7/26/2011	7/27/2011	7/27/2011	7/26/2011	7/26/2011	7/27/2011
Depth (ft):		8 - 9	15 - 16	4 - 5	9 - 10	9 - 10	13 - 14	22 - 23	10 - 11	18 - 19	7 - 8
Matrix:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Analyte/Methods (Units)	**Screening Level**										
Volatile Organic Compounds/SW8260B (µg/kg)											
1,1,1-Trichloroethane	8,100,000	<4.05	<5.54	**11.2**	**6.9 T**	**6.89**	<4.95	<5.57	<6.03	<5.66	<618
1,1,2-Trichloroethane	1,100	<0.57	<0.67	<0.57	<0.59	<0.59	<0.56	<0.59	<0.61	<0.61	<0.6
1,1-Dichloroethane	3,600	**1.31 T**	<1.33	<1.15	<1.19	<1.18	<1.12	<1.18	**3.94 T**	**1.91 T**	<1.19
1,1-Dichloroethene	230,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	<6.03	<5.66	<0.6
1,2,4-Trichlorobenzene	24,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	<6.03	<5.66	<0.6
1,2,4-Trimethylbenzene	300,000	**4.87**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**15.6**	<5.66	**1950**
1,3,5-Trimethylbenzene	270,000	**4.49**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**7.42**	<5.66	**980**
2-Butanone (MEK)	27,000,000	<8.11	<11.1	<9.75	<14.5	<10.1	8.93 T,U,J+	**12.1 J**	**23.2**	<11.3	<1240
Acetone	61,000,000	<8.11	<11.1	<9.75	<14.5	<10.1	**61.1 J+**	**66.3 J**	**96.2**	7.93 T,U	<1240
Benzene	1,200	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	**0.736 T**	**1.11 T**	<0.6
cis-1,2-Dichloroethene	160,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	**30.7**	**8.7**	**107 T**
Ethylbenzene	5,800	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	<6.03	<5.66	<0.6
Isopropylbenzene	NE	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**0.747 T**	<5.66	**83.9 T**
m,p-Xylene (Sum of Isomers)	1,110,000	**0.788 T**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	**0.673 T**	<5.66	**121 T**
Methylene chloride	57,000	<4.05	**2.13 T**	<4.88	<7.23	<5.06	<4.95	**4.29 T,J-**	<6.03	<5.66	<1.19
n-Butylbenzene	3,900,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**4.6 T**	<5.66	**1030**
n-Propylbenzene	3,800,000	**0.594 T**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**1.16 T**	<5.66	**167 T**
Naphthalene	3,800	2.66 T,U	<11.1	<9.75	<14.5	<10.1	<9.9	<11.1 UJ	**2.84 T**	<11.3	**1550**
o-Xylene	650,000	**0.562 T**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	<6.03	<5.66	**114 T**
p-Isopropyltoluene	NE	**1.36 T**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**1.97 T**	<5.66	**358 T**
sec-Butylbenzene	7,800,000	**0.608 T**	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**5.85 T**	<5.66	**360 T**
t-Butylbenzene	7,800,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57 UJ	**2.1 T**	<5.66	**102 T**
Tetrachloroethene (PCE)	24,000	**1.79 T**	**1.23 T**	<0.57	<0.59	<0.59	<0.56	<0.59	<0.61	<0.61	<0.6
Toluene	4,900,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	<6.03	<5.66	<618
trans-1,2-Dichloroethene	1,600,000	<4.05	<5.54	<4.88	<7.23	<5.06	<4.95	<5.57	<6.03	<5.66	<0.6
Trichloroethene (TCE)	940	<0.57	<0.67	<0.57	<0.59	<0.59	<0.56	<0.59	<0.61	<0.61	<0.6
Semi-Volatile Organic Compounds/SW8270C (µg/kg)											
2-Methylnaphthalene	240,000	<188	<246	<198	<192	<204	<201	<218	<213	<178	**5430**
Acenaphthene	3,600,000	<188	<246	<198	<192	<204	<201	<218	<213	<178	<173
Fluorene	2,400,000	<188	<246	<198	<192	<204	<201	<218	<213	<178	**550**
Naphthalene	3,800	<0.57	<0.67	<0.57	<0.59	<0.59	<0.56	<0.59	<0.61	<0.61	**1360**
Phenanthrene	NE	<188	<246	<198	<192	<204	<201	<218	<213	<178	**960**
Pyrene	1,800,000	<188	<246	<198	<192	<204	<201	<218	<213	<178	<173

Screening Level Source evaluated using hierarchy below
A - State of Idaho Risk Evaluation Manual for Petroleum Releases Table 2 Screening Level Concentrations for Soil Direct Contact (IDEQ, 2012)
B - USEPA RSLs for Chemical Contaminants at Superfund Sites Residential Soil (USEPA, 2017) corresponds to HQ = 1 and TR = 1E-6

TABLE 1-1
SOIL ANALYTICAL RESULTS
BALLARD SHOP AREA INVESTIGATION

Location Identification:		SB08	SB09	SB09	SB09	SB10	SB10	SB10	SB11	SB11	SB11 Dup
Field Sample Identification:		►SB08 (10 TO 11)	►SB09 (5 TO 6)	►SB09 (12 TO 13)	►SB09 (15 TO 16)	►SB10 (8TO9)	►SB10 (12TO13)	►SB10 (16TO16.5)	►SB11 (5TO5.5)	►SB11 (8TO8.5)	►SB11 (8TO8.5)-1
Date Collected:		7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011	7/27/2011
Depth (ft):		10 - 11	5 - 6	12 - 13	15 - 16	8 - 9	12 - 13	16 - 16.5	5 - 5.5	8 - 8.5	8 - 8.5
Matrix:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Analyte/Methods (Units)	**Screening Level**										
Volatile Organic Compounds/SW8260B (µg/kg)											
1,1,1-Trichloroethane	8,100,000	<6.63	<595	**0.54 T**	<4.14	<5.58	<6.81	<5.27	**12.9**	**7.73**	**12.2**
1,1,2-Trichloroethane	1,100	<0.59	<0.58	<0.57	**0.489 T**	<0.62	<0.61	<0.56	<0.58	<0.59	<0.59
1,1-Dichloroethane	3,600	**4.26 T**	<1.17	**15.2**	**9.22**	<1.23	<1.22	<1.12	<1.16	<1.18	<1.18
1,1-Dichloroethene	230,000	<6.63	<0.58	<4.49	<4.14	<5.58	<6.81	<5.27	**0.712 T**	<6.55	**0.726 T**
1,2,4-Trichlorobenzene	24,000	<6.63	<0.58	**<4.49;1420**	<4.14	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
1,2,4-Trimethylbenzene	300,000	<6.63	**9820**	NA	**67.3**	<5.58	**3.21 T**	<5.27	<5.75	<6.55	<6.7
1,3,5-Trimethylbenzene	270,000	<6.63	**2920**	**76.1**	**27.9**	<5.58	**1.55 T**	<5.27	<5.75	<6.55	<6.7
2-Butanone (MEK)	27,000,000	<13.3	<1190	<8.98	<8.27	**25.1**	**24.4**	<10.5	<11.5	<13.1	<13.4
Acetone	61,000,000	<13.3	<1190	**9.8**	**7.13 T**	**97.4**	**96.3**	<10.5	<11.5	<13.1	<13.4
Benzene	1,200	<6.63	<0.58	**2.17 T**	**1.41 T**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
cis-1,2-Dichloroethene	160,000	**21.1**	**70.8 T**	**23.3**	**14.7**	**11.5**	**5.79 T**	**2 T**	<5.75	<6.55	<6.7
Ethylbenzene	5,800	<6.63	**552 T**	**15.1**	**6.2**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
Isopropylbenzene	NE	<6.63	**276 T**	**8.31**	**3.41 T**	**0.783 T**	<6.81	<5.27	<5.75	<6.55	<6.7
m,p-Xylene (sum of isomers)	1,110,000	<6.63	**2340**	**58**	**22.9**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
Methylene chloride	57,000	**5.28 T**	<1.17	**2.88 T**	**3.31 T**	**2.64 T**	<6.81	**3.7 T**	<5.75	**1.41 T**	**4.67 T**
n-Butylbenzene	3,900,000	**0.778 T**	**2710**	<4.49	**15.6**	<5.58	**1.95 T**	<5.27	<5.75	<6.55	<6.7
n-Propylbenzene	3,800,000	<6.63	**773**	**17.2**	**6.72**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
Naphthalene	3,800	**3.43 T**	**4440**	**203 T**	**112**	<11.2	2.29 T,U	<10.5	<11.5	<13.1	<13.4
o-Xylene	650,000	<6.63	**951**	**20.6**	**8.18**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
p-Isopropyltoluene	NE	<6.63	**815**	**16.1**	**5.52**	**0.88 T**	**1.01 T**	<5.27	<5.75	<6.55	<6.7
sec-Butylbenzene	7,800,000	**0.835 T**	**566 T**	**11.9**	**4.35**	**3.86 T**	**2.32 T**	<5.27	<5.75	<6.55	<6.7
t-Butylbenzene	7,800,000	<6.63	**124 T**	**3.35 T**	**1.18 T**	**2.1 T**	<6.81	<5.27	<5.75	<6.55	<6.7
Tetrachloroethene (PCE)	24,000	<0.59	<0.58	**4.2 T**	**2.26 T**	<0.62	**4.09 T**	<0.56	<0.58	<0.59	<0.59
Toluene	4,900,000	<6.63	<595	**0.964 T**	**0.449 T**	<5.58	<6.81	<5.27	<5.75	<6.55	<6.7
trans-1,2-Dichloroethene	1,600,000	<6.63	<0.58	<4.49	<4.14	**1.14 T**	<6.81	<5.27	<5.75	<6.55	<6.7
Trichloroethene (TCE)	940	<0.59	<0.58	<0.57	<0.56	**2.7 T**	**1.28 T**	<0.56	<0.58	<0.59	<0.59
Semi-Volatile Organic Compounds/SW8270C (µg/kg)											
2-Methylnaphthalene	240,000	<197	**6540**	<212	**597**	<219	<211	<181	<222	<175	<195
Acenaphthene	3,600,000	<197	**370**	<212	<210	<219	<211	<181	<222	<175	<195
Fluorene	2,400,000	<197	**688**	<212	<210	<219	<211	<181	<222	<175	<195
Naphthalene	3,800	<0.59	**1480**	<0.57	**136 T**	<0.62	<0.61	<0.56	<0.58	<0.59	<0.59
Phenanthrene	NE	<197	**2110**	<212	**316**	<219	<211	<181	<222	<175	<195
Pyrene	1,800,000	<197	**153 T**	<212	<210	<219	<211	<181	<222	<175	<195

Notes:
► Sample prefix (all samples) = 1107-SO-
µg/kg micrograms per kilogram
Bold Bolded result indicates positively detected compound
NA Not analyzed
NE Not established

J Data are estimated due to associated quality control data.
J- Data are estimated, potentially biased low, due to associated quality control data.
J+ Data are estimated, potentially biased high, due to associated quality control data.
T Analyte was positively identified but the reported concentration is less than the reporting limit but greater than the method detection limit.
U Analyte is considered not detected.
UJ Potential low bias, possible false negative.

TABLE 1-2

SUMMARY OF TIER II RME BALLARD SHOP CUMULATIVE RISK ESTIMATES FOR HUMAN RECEPTORS

	Hypothetical Future Resident			
	ILCR [a]	**Risk Drivers [b]**	**HI [a]**	**Risk Drivers [b]**
Indoor Air - Upland Soil	**1E-05**	Naphthalene	**5**	1,2,4-Trimethylbenzene
Fruits and Vegetables - Upland Soil and Groundwater	1E-06	Trichloroethene (TCE)	0.1	--

Notes:

[a] Media-specific cumulative ILCR and HI for all chemicals of potential concern (COPCs) following the Tier I risk assessment.

[b] Analytes with a chemical-specific Tier II RME ILCR or hazard quotient (HQ) greater than the USEPA's risk management range and/or IDEQ's acceptable risk criteria are listed as media-specific risk drivers.

Bold indicates exceedence of the USEPA's risk management range and/or IDEQ's acceptable risk criteria.

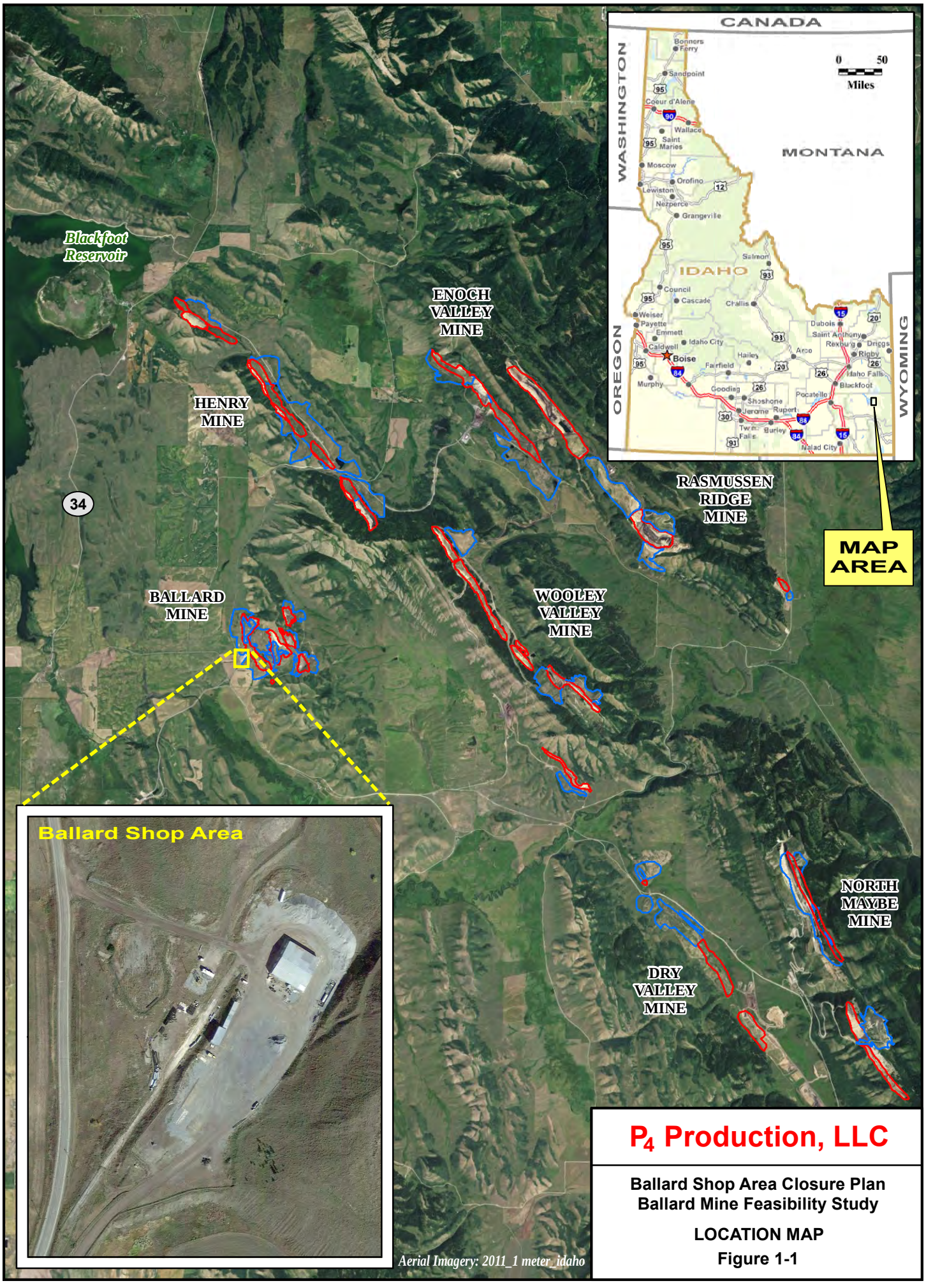
HI - Hazard Index
IDEQ - Idaho Department of Environmental Quality
ILCR - Incremental lifetime cancer risk
RME - reasonable maximum exposure
USEPA - United States Environmental Protection Agency

TABLE 1-3
GROUNDWATER ANALYTICAL RESULTS
BALLARD SHOP AREA INVESTIGATION

Location Identification: Field Sample Identification: Date Collected: Matrix: Analyte/Methods (Units)	Action Level	MBW011 1107-GW-MBW011-U 7/26/2011 Groundwater	MBW011 1405GWMBW011-U 5/12/2014 Groundwater	SB01 1107-GW-SB01-U 8/5/2011 Groundwater	SB03 1107-GW-SB03-U 7/25/2011 Groundwater	SB03 1107-GW-SB03-U 8/5/2011 Groundwater	SB03 Dup 1107-GW-SB03-U-1 8/5/2011 Groundwater	SB03 1107-GW-SB03-U-avg 8/5/2011 Groundwater	SB07 1107-GW-SB07-U 7/20/2011 Groundwater	SB07 1504-GW-SB07-U 4/19/2015 Groundwater
Volatile Organic Compounds/SW8260B (µg/l)										
1,1,1-Trichloroethane (TCA)	200	*<5.0*	--	**0.31 T**	**9.49**	**12**	**12.6**	**12.3**	**1.82 T**	--
1,1-Dichloroethane	2.8	*<0.13*	--	**0.625 T**	**2.18 T**	**2.31 T**	**2.33 T**	**2.32 T**	**1.27 T**	--
1,1-Dichloroethene	7	*<5.0*	--	*<5.0*	**0.817 T**	**1.08 T**	**1.05 T**	**1.065 T**	*<5.0*	--
Acetone	14,000	*<10*	--	*<10*	**4.13 T**	**7.79 T**	**7.26 T**	**7.525 T**	*<10*	--
cis-1,2-Dichloroethene	70	*<5.0*	--	*<5.0*	**0.328 T**	**0.375 T**	**0.382 T**	**0.3785 T**	**1.66 T**	--
Tetrachloroethene (PCE)	5	*<0.25*	--	**3.46 T**	**0.951 T**	**1.64 T**	**1.71 T**	**1.675 T**	**6.98**	**13.2**
Trichloroethene (TCE)	5	*<0.25*	--	**0.505 T**	*<0.25*	*<0.25*	*<0.25*	*<0.25*	**0.443 T**	
Semi-Volatile Organic Compounds/SW8270C (µg/l)										
bis(2-ethylhexyl) Phthalate	5.6	**16.5**	*<2.63*	*<2.5*	NA	*<2.5*	*<2.5*	*<2.5*	*<2.5*	--

Notes:
µg/l micrograms per liter.
Italic Italicized result indicates analyte reported to the method detection limit.
Bold Bolded result indicates positively identified compound.
Shaded Shaded result indicates result or method detection limit greater than or equal to the action level. NA Not analyzed.
R Associated quality control did not meet acceptance criteria.
T Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
UJ Potential low bias, possible false negative. Screening Level Source evaluated using hierarchy below
A – Federal Drinking Water Maximum Contaminant Levels (MCLs)/State of Idaho Ground Water Quality Rule (IDAPA 58.01.11)
B – USEPA RSLs for Chemical Contaminants at Superfund Sites Tap Water (USEPA, 2017)

FIGURES



DRAWN BY D. Severson

29 Nov 2016

J:\Industrial Projects\P4 Monsanto\10504703_BALLARD_R\Drafts\FIGURES\Fig 1-1_Ballard Mine_Site Location Map_4Dec2016.mxd

P_4 Production, LLC

Ballard Shop Area Closure Plan
Ballard Mine Feasibility Study

LOCATION MAP
Figure 1-1

J:\Industrial Projects\P4 Monsanto\10504703_BALLARD_RI\Drafts\FIGURES\Fig 1-2_Ballard Mine Shop_Sample Loc Map_SPNAD27_2Feb2017.mxd 2 Feb 2017 DRAWN BY D. Severson

MW-15A
MMW021
Location of Former USTs
Powder Magazines
Road to Mine Shop
Approximate Location of Propane Tank
Slag Pile
SB-09
SB-08
SB-01
Approximate Limit of TPH Contamination 1991 Investigation
Overhead Doors
SB-07
SB-10
Flammable Storage Shed
Core Shed
SB-04
Grease Pit
SHOP BUILDING
Grated Floor Sump
SB-11
Overhead Doors
Transformers on pad
Shed
SB-06
SB-02
SB-05
3 Transformers on Elevated Platform
SB-03
Closed Shed
Fuel Tank Containment
Former Office Building
Storage Sheds
Reclamation Equipment Storage
Prill Tower
Lay Down Area
Slag Pile
Slag pile removed in 2016
Slag Area September 2012
N
W
E
S
0 50 100
Scale in Feet
(3) 10,000 Gallon Off Road Diesel
Bulk Oil Trailer
(1) 10,000 gallon Split Tank: Road Diesel/Gasoline
Used Oil Tanks (2) 4,000 Gallons
ANFO Trailers
Ballard Mine
MAP AREA
MBW011

EXPLANATION

- Soil boring location (extended to groundwater)
- Soil boring location (not extended to groundwater)
- Monitoring well location
- New area added since 2011

MWH® now part of Stantec

AERIAL IMAGERY SOURCE: Google Earth
IMAGERY DATE: 7 October 2014

P_4 Production, LLC

Ballard Shop Area Closure Plan
Ballard Mine Feasibility Study

SITE AND SAMPLE LOCATION MAP

Figure 1-2

J:\Industrial Projects\P4 Monsanto\10504703_BALLARD_RI\Drafts\FIGURES\Fig 1-3_Ballard Mine Shop_Soil Boring Samples with Risk_Driver VOC Results_Feb2017.mxd 2 Feb 2017 DRAWN BY D. Severson

MW-15A

MMW021

Road to Mine Shop

SB-09
0'
9820/4440
10'
NS/203
67.3/112
17.5'

SB-08
0'
1950/1550
10'
<6.63/3.43
12.5'

SB-10
0'
<5.58/<11.2
10'
3.21/2.29U
<5.27/<10.5
16.5'

SB-01
0'
4.87/2.66U
10'
<5.54/<11.10
20'
30'
40'
50'

Location of Former USTs

Powder Magazines

Approximate Location of Propane Tank

Slag Pile

SB-09

SB-08

SB-01

Approximate Limit of TPH Contamination 1991 Investigation

Flammable Storage Shed

SB-07

SB-04

SB-10

Core Shed

Transformers on pad

Grease Pit

SHOP BUILDING

Grated Floor Sump

SB-11

SB-02

SB-06

SB-05

3 Transformers on Elevated Platform

SB-03

Fuel Tank Containment

Former Office Building

SB-04
0'
15.6/2.84
10'
<5.66/<11.3
20'
30'
35'

Prill Tower

Slag Pile

Slag pile removed in 2016

Slag Area September 2012

(3) 10,000 Gallon Off Road Diesel

Bulk Oil Trailer

(1) 10,000 gallon Split Tank: Road Diesel/Gasoline

Used Oil Tanks (2) 4,000 Gallons

N
W
E
S

0 50 100
Scale in Feet

ANFO Trailers

MAP AREA

Ballard Mine

SOIL BORINGS

Slag

Fill/native

Sample interval

U Analyte considered not-detected based on associated blank data

15.6 1,2,4-trimethylbenzene (µg/kg)

2.84 Naphthalene (µg/kg)

USEPA Residential screening levels (May, 2016) for:

1,2,4-Trimethylbenzene – 58,000 µg/kg

Idaho Risk Evaluation Manual for Petroleum Releases (August, 2012) for:

Naphthalene – 44,000 µg/kg

None of the risk-driver VOCs are over these RSLs.

SB-05, 06, 07 were not sampled for VOCs/SVOCs.

SB-02, SB-03, and SB-11 did not have any detections of either VOC above their method detection limits (MDLs).

All concentrations in micrograms per kilogram (µg/kg)

EXPLANATION

Soil boring location (extended to groundwater)

Soil boring location (not extended to groundwater)

Monitoring well location

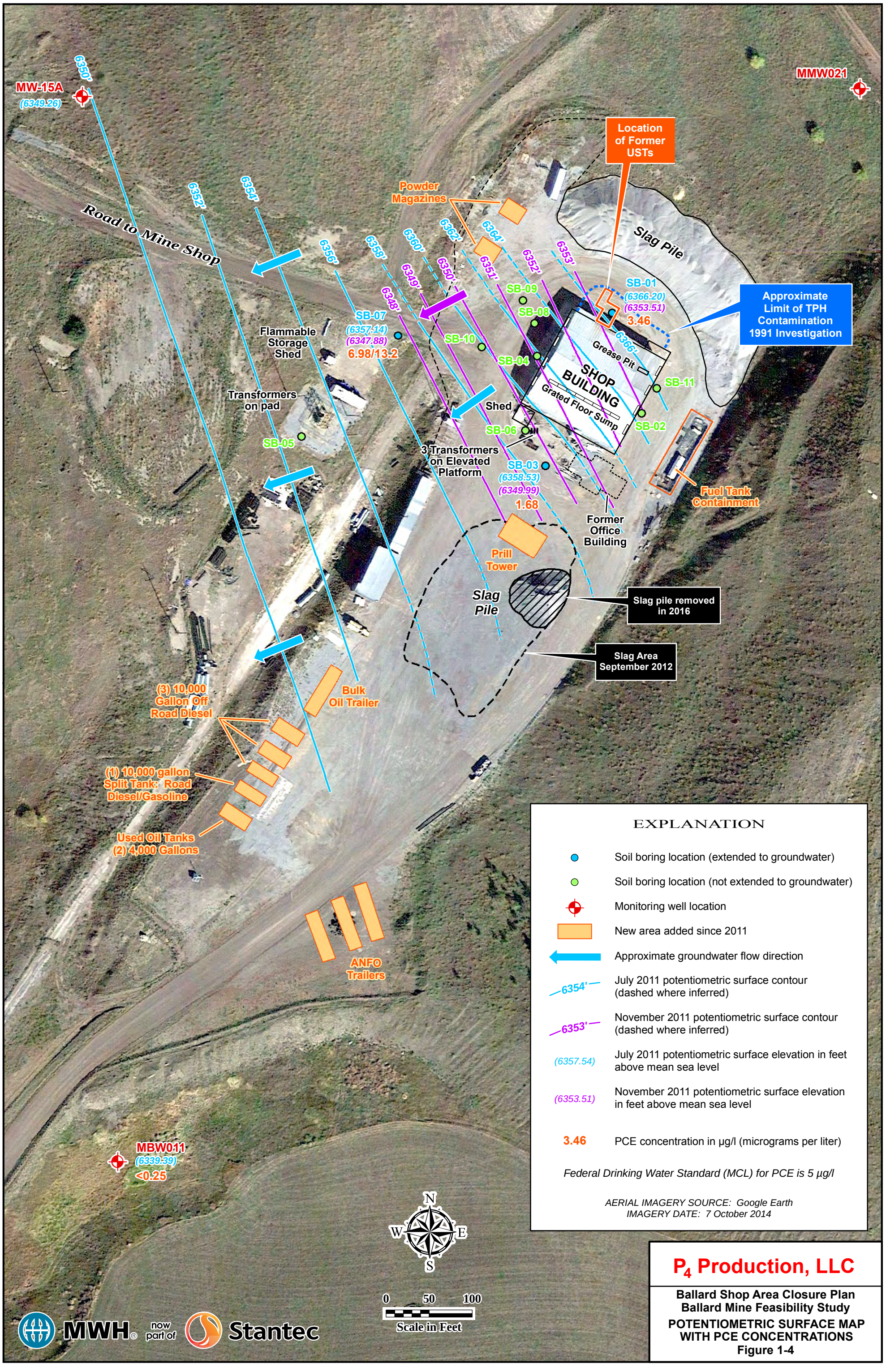
New area added since 2011

MWH® now part of Stantec

AERIAL IMAGERY SOURCE: Google Earth
IMAGERY DATE: 7 October 2014

P_4 Production, LLC

Ballard Shop Area Closure Plan
Ballard Mine Feasibility Study
SOIL BORING SAMPLES WITH RISK-DRIVER VOC RESULTS
Figure 1-3



EXPLANATION

- Soil boring location (extended to groundwater)
- Soil boring location (not extended to groundwater)
- Monitoring well location
- New area added since 2011
- Approximate groundwater flow direction
- 6354' — July 2011 potentiometric surface contour (dashed where inferred)
- 6353' — November 2011 potentiometric surface contour (dashed where inferred)
- (6357.54) — July 2011 potentiometric surface elevation in feet above mean sea level
- (6353.51) — November 2011 potentiometric surface elevation in feet above mean sea level
- 3.46 — PCE concentration in µg/l (micrograms per liter)

Federal Drinking Water Standard (MCL) for PCE is 5 µg/l

AERIAL IMAGERY SOURCE: Google Earth
IMAGERY DATE: 7 October 2014

MWH now part of Stantec

P_4 Production, LLC

Ballard Shop Area Closure Plan
Ballard Mine Feasibility Study

POTENTIOMETRIC SURFACE MAP WITH PCE CONCENTRATIONS
Figure 1-4

APPENDIX A

COMMENTS AND COMMENT RESPONSE DOCUMENTS

APPENDIX A-1

A/T Comments on *P4's Ballard Mine Shop Closure Memorandum, Draft Revision 0, February 2017*

Transmitted to P4 on April 20, 2017

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
IDAHO OPERATIONS OFFICE
950 West Bannock, Suite 900
Boise, Idaho 83702

April 20, 2017

Molly R. Prickett
Environmental Engineer
Monsanto Company
Soda Springs Operations
1853 Highway 34
Soda Springs, Idaho 83276

Re: A/T Comments on Ballard Mine Shop Closure Memorandum, Draft, Revision 0, February 2017.

Dear Ms. Prickett,

The Agencies and Tribes (A/T) have reviewed the above referenced deliverable, submitted pursuant to the Administrative Settlement Agreement and Order on Consent/Consent Order for Performance of Remedial Investigation and Feasibility Study at the Enoch, Henry, and Ballard Mine Sites in Southeastern Idaho (or 2009 AOC). This letter transmits comments and direction on this draft deliverable.

We will be available to discuss these comments in the coming weeks. Based on our review, it appears necessary to resolve remaining comments prior to issuance of a revised draft. Please contact me if you have questions. I can be reached at 208-378-5763 or electronically at tomten.dave@epa.gov.

Sincerely,

//s//

Dave Tomten
Remedial Project Manager

Enclosure

cc: Mike Rowe, IDEQ – Pocatello
Jeremy Moore, US FWS - Chubbuck
Kelly Wright, Shoshone Bannock Tribes
Colleen O'Hara, BLM – Pocatello
Sherri Stumbo, Forest Service – Pocatello (electronic version only)

Vance Drain, MWH (electronic version only)
Shannon Ansley, Shoshone Bannock Tribes (electronic version only)
Dennis Smith, CH2MHill (electronic version only)
Gary Billman, IDL – Pocatello (electronic version only)

A/T Review Comments on Ballard Mine Shop Closure Memorandum, Draft, Revision 0, February 2016.

General Comments

A. This report presents recommended interim actions to protect workers while the shop area continues to be used, and a strategy for developing a final remedy that would be implemented at some point in the future. The A/T believes that this approach is reasonable under the circumstances. Under this approach, interim actions may be implemented in the near term, and a focused FS and ROD for the shop area deferred to a future date when the shop area is no longer in active use. The report should be revised to clarify the process, and to distinguish between the recommended elements that would be implemented in the near term, and strategy or plan for developing a focused FS. As a starting point, the title of the report should reflect that the document is plan describing recommended interim actions, and a strategy for developing final recommendations.

B. This report is informative, however, it is not a feasibility study nor does it consistently follow CERCLA RI/FS guidance. As such, it does not provide critical evaluation information about proposed alternatives (such as effectiveness, implementability and cost, or the rigors of applying NPL threshold and balancing criteria). Consistent with general comment A (above), in describing the strategy for developing a focused FS, include a description of the elements of a future focused FS.

C. References in the Ballard Mine FS Tech Memos indicate that remedial action at the Ballard shop would be deferred until the mine site is remediated. Institutional Controls (ICs) were recommended during this interim period to limit potential exposures until a focused FS is completed and the site can be remediated. The draft Ballard Mine Closure Memorandum reflects this approach. This memorandum does not provide nearly the level of detail in the alternatives, nor the evaluation and comparative analysis of alternatives against criteria, that is normally included in an FS. There are uncertainties not only with alternatives details, but also with site characterization in the Shop area. Uncertainties associated with site characterization include:

- The depth and areal extent of contaminated groundwater – there are only data from 3 temporary monitoring points (TMPs), one of which exhibited PCE above MCLs, plus 2 irrelevant monitoring wells (for delineation purposes) which are outside the flow path from the Shop. It is unknown whether contamination emanating from the Shop might occur in the hundreds of feet between the TMPs.

- Does contaminated soil and/or groundwater extend beneath the Shop slab. It would be somewhat surprising if there isn't, considering that the Shop contained a grease pit and floor drain.

- Whether there is any contamination that has or will occur due to leaks/spills/releases from existing fuel tank and explosives currently stored at the Shop area. It appears that the existing storage tanks may not have secondary containment, or containment pads for transfer of fuels.

Therefore, the strategy for developing a focused FS for the shop area should acknowledge and describe potential data gaps, and include plans or steps to address data gaps to clarify that the shop area would be subject to further characterization and a focused FS upon

completion of the mine site remediation. At that time, use of, or decommissioning of, the shop would be clearer along with definitive remedial actions that could be successfully applied to final site conditions. At this time, too many uncertainties (as described above) exist for remediation of both Shop area soil and groundwater, which will not be resolved (because of its proposed use) until the remediation of the mine site is complete or nearing completion.

Specific Comments

Report

1. **Page 1-3, Section 1.1, last paragraph:** New fuel and explosive storage areas have been noted at the shop area. The plan indicates that a records review will be conducted to identify whether any spills have occurred. In addition to the records review it would be prudent to also conduct a visual survey of these areas to identify and document whether any soil staining is present that may require additional sampling.
2. **Page 1-3, Section 1.1, 3rd paragraph:** Given the presence of a new storage area with a wide variety of hydrocarbons (used oil, diesel/gasoline, bulk oil), it would advisable to sample beneath the concrete pad of these storage areas (used oil tanks, split tank, road diesel, and bulk oil trailer) prior to closures of the Shop Area to ensure total aromatic and aliphatic hydrocarbons in the soil are below the EPA's RSLs.
3. **Page 1-4, Section 1.3.1**. Somewhere in this section, it should be acknowledged that there is a potential for contaminated soil to exist beneath the shop slab (considering that the shop contained a grease pit and floor drain), which has not yet been evaluated. This should be investigated (and risk re-evaluated) if/when the shop is demolished.
4. **Page 1-5, Section 1.3.1, first paragraph, last sentence.** Add text indicating that the detected levels of MEK are below relevant risk screening levels.
5. **Page 1-5, Section 1.3.1, last paragraph.** It is indicated that PCBs were evaluated and not detected above the Reporting Limits (RLs). It is recommended that a statement be added to the risk summary section that describes whether any RLs for non-detected constituents at the Ballard Shop were above their respective screening levels. This will help the reader understand this potential uncertainty in the risk findings.
6. **Page 1-5, Section 1.3.1, 3rd paragraph**; Based on Table 1-1 it appears that there were other VOCs detected above the RL in borings SB-08, SB-09, and SB-10 in addition to the ones listed (e.g., cis-1,2-dichloroethene, naphthalene in SB-08; 1,1-dichloroethane, cis-1,2-dichloroethene, isopropylbenzene, naphthalene, and sec-butylbenzene in SB-09; 2-butanone (MEK), acetone, and cis-1,2-dichloroethene in SB10). Revise accordingly
7. **Page 1-6, Soil Risk Summary, Human Health Risk section**. Does this mean that naphthalene and 1,2,4-Trimeythlbenzene (TMB) <u>are</u> in fact soil COCs, but do not warrant consideration when evaluating soil remedial technologies and alternatives because (a) residential land use is unlikely, and (b) they were only found at isolated spots and at relatively low levels? Does this mean that ICs/LUCs are needed to prevent future residential use? Please clarify.
8. **Page 1-6, Section 1.3.1, Bullet 1:** Indicate the following: a) methodology used for the calculation of the risk (i.e., use of any software application) b) citation of the risk calculations, if there is not a document with the calculations mentioned in Table 1-2, include these calculations as an appendix of this document.

9. **Page 1-6, Soil Risk Summary, Risk to the Environment section**. Does this mean that 1,2,4-TMB is in fact a soil COEC, but does not warrant consideration when evaluating soil remedial technologies and alternatives because it was only found at one isolated spot?

10. **Page 1-7, Section 1.3.2, first paragraph.** Did the HHRA for the P4 Plant Site include evaluation of both chemical and radiological exposures? Additional discussion that further describes the exposures evaluated at the P4 Plant Site is necessary to confirm that the findings from that evaluation are representative of exposures identified as complete in the Ballard Mine CSM.

11. **Page 1-7, Section 1.3.3, Groundwater Nature and Extent and Risk Summary:** Similar to the comment above on soil nature and extent, somewhere in this section it should be acknowledged that there is a potential for contaminated groundwater to exist beneath the shop slab (considering that the shop contained a grease pit and floor drain), which has not yet been evaluated, and that this should be investigated (and risk re-evaluated) if/when the shop is demolished. Also, monitoring at only the three temporary monitoring points (TMPs) used to investigate groundwater around the shop building does not seem entirely adequate to determine if there is contamination emanating from the shop, particularly given that PCE was detected at SB-07. Is any more investigation planned to investigate/delineate groundwater contamination? If not, suggest that this be included in groundwater Alts 2 and 3.

12. **Pages 1-7 and 1-8, Section 1.3.3, Groundwater Nature and Extent and Risk Summary:** Groundwater flow direction was determined to be southwest to west-southwest. Please identify the depth to the first water bearing unit and fully define the lateral extent of the PCE plume.

13. **Page 1-8, Groundwater Risks Summary section**. Should the bold title "Risk to Human Health" appear in the 1st bullet (rather than the 2nd) indicating that it applies to both bullets 1 and 2? Does the text in these two bullets mean that PCE is in fact a groundwater COC? Does this mean that ICs are needed to prevent residential land use or well installation?

14. **Page 2-1, Section 2.1, 1rst paragraph:** The reader is directed to the *Ballard FS Memo #1* for a list of applicable RAOs. Since this closure memo will likely become an attachment to Ballard FS Memo #2, please include a table with applicable RAOs to make it a more comprehensive document.

15. **Page 2-1, 3rd paragraph (after first 3 bullets)**. The sentence "The Shop Area GRAs were developed specifically for the COCs/COECs identified in Section 1.3" is confusing with respect to other document text. It is not clear what constituents, if any, were identified as COCs/COECs in Section 1.3, and the Soil Risk Summary portion of Section 1.3 states that no organic COCs or COECs in soil warrant consideration in the evaluation of technologies and alternatives. Accordingly, Alt 3 focusses on potential future use of technologies to remove contaminants that may be found under the slab, not COCs/COECs identified in prior investigations (and described in Section 1.3). Please clarify.

16. **Page 2-2, Section 2.2.1, second paragraph.** Needs editorial attention.

17. **Page 2-2, Section 2.2, Soil Technology Review and Closure Alternative Development:** Alternative screening was not performed in accordance with EPA RI/FS guidance. A future focused FS must evaluate alternatives using the NPL criteria. The reader was also left to ponder whether building slabs would be removed and potentially contaminated soils exposed. No details with respect to volume estimates of soils to be removed, repository destinations, or haulage distance for clean borrow material were provided for cost estimating. (detailed information was also lacking for potential groundwater remediation – see Section 2.3)

18. **Page 2-2. Section 2.2.2 (Alternative 2)**. Agree that this is a viable alternative, but it is very non-specific and hypothetical as currently described. Describe in more detail what ICs/LUCs would likely be included in this alternative.

19. **Pages 2-3 through 2-6. General comment on groundwater alternatives**. Is there also the potential to encounter contaminated groundwater beneath the shop slab in the event that the shop is demolished, similar to the potential for soil contamination considered in the soil alts? If so, the groundwater alternatives should be addressed in a manner consistent with the soil alternatives.

20. **Page 2-5, Section 2.3.3 (Alt 3), bullet list of in-situ technologies**. Air sparging, with or without Soil Vapor Extraction, may be an additional, potentially-viable technology for chlorinated VOCs in groundwater.

21. **Page 3-1, Section 3.0**. It appears that the term "Remedial Action" here refers to the entire Ballard Site RA, and not just the Shop RA. This becomes evident later, but suggest making it clear up-front.

22. **Page 4-1, Section 4.2, Groundwater**. Recommend a Groundwater Contingency section be added, analogous to the Soil Contingency section, to discuss contingencies in the event that further groundwater contamination above acceptable levels were to be found, e.g., during supplemental groundwater investigation efforts around the shop, or beneath the slab after shop demolition?

Ballard Mine Shop Closure Report
(January 2017)

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
1	**Acronyms and Abbreviations**	**ii**			Delete "DOI Department of the Interior" as it is not used after it is defined in the text.	
2	**1.0**	**1-1**	**Bullet 2**	**1**	Delete "that" to read "… possible alternatives for the …"	
3	**1.0**	**1-1**	**Bullet 3**	**2**	Put a period after "period" for consistency.	
4	**1.0**	**1-1**	**3**	**7**	Delete "(DOI)" as it is not used after this occurrence.	
5	**1.1**	**1-2**	**2**	**5**	Change "south west" to "southwest."	
6	**1.1**	**1-3**	**1**	**1**	Delete the first "also" to read "Crushed slag has also been stockpiled …"	
7	**1.1**	**1-3**	**2**	**5**	Change "was" to "were" to read "The Shop building and immediate area were used …" for subject-verb agreement.	
9	**1.3.1**	**1-5**	**2**	**3**	It appears that the depth for the soil sample with concentrations above the RL at SB-04 was "10 to 11-foot bgs" not "8 to 9-foot bgs." Revise accordingly.	
11	**1.3.1**	**1-5**	**3**	**4**	Change to "n-propylbenzene" for consistency.	
13	**1.3.1**	**1-6**	**Bullet 2**	**4**	Delete the 2nd "y" to read "1,2,4-trimethylbenzene."	
14	**1.3.1**	**1-6**	**Bullet 2**	**8**	Table 1-1 states that the screening level of 1,2,4-Trimethylbenzene is 58,000 µg/kg not 62,000 µg/kg. Clarify or revise accordingly.	
15	**1.3.1**	**1-6**	**Bullet 2**	**9 (last)**	Delete the 2nd "y" to read "1,2,4-trimethylbenzene."	
16	**1.3.1**	**1-6**	**Bullet 4**	**3 & 4**	Indicate which other indicator species had an HQ estimate below 1 and cite the document where these calculations were made.	
17	1.3.3	1-8	2	3	The text states: "Only 1,1,1-trichloroethane (1,1,1-TCA in SB-03)…" For consistency add to Table 1-3 the same nomenclature: 1,1,1-trichloroethane (TCA).	

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
18	1.3.3	1-8	3	3	The screening value for bis(2-ethylhexyl) phthalate does not match with the screening value mentioned in Table 1-3. Revise accordingly.	
19	1.3.3	1-8	3	7	Insert a space to read "bis(2-ethylhexyl) phthalate" for consistency.	
20	2.2	2-2	2	3	Insert a comma to read "technologies, and the alternatives …" for consistency.	
21	2.2.3	2-3	3	Sentence 7 (last)	Include an avian nest clearance survey under this alternative.	
22	2.3	2-4	Bullet 1		Was this determination made also for livestock and wildlife? If so, include this information in this section of the document. If not the document needs to state that the potential risk to PCE to wildlife has not been determined and the likelihood of PCE to contaminate springs, ponds or wildlife water sources around the Shop area.	
23	3.1	3-1	1	2	Insert "for" twice and change to "infrequently" to read "… for fuel storage and fueling, and infrequently for other activities …"	
24	3.1	3-1	1	7	Insert "for" to read "… and for likely continued …"	
25	3.1	3-1	2	2	Change "facilities" to "facilities'."	
26	5.0	5-1	Ankrum citation		Change the period to a comma to read "Ankrum, Keith, 1992. …" for consistency.	
27	Table 1-1	2 of 2	Notes		The footnotes should indicate that the USEPA RSLs for Chemical Contaminants at Superfund Sites Residential Soil (USEPA, 2016) correspond to HQ=1 and TR= 1E-06.	
28	Table 1-1	2 of 2	Notes		Add "**Bold** Bolded result indicates positively identified compound."	
29	Table 1-1	2 of 2	Notes		Change to "*Italic* Italicized result indicates analyte reported to the method detection limit."	

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
	Table 1-1				Revise “m,p-Xylene (Sum of lisomers)” to read “m,p-Xylene (Sum of isomers)”	

APPENDIX A-2

P4 Responses to A/T Comments (dated April 20, 2017) on *P4's Ballard Mine Shop Closure Memorandum, Draft Revision 0, February 2017*

Submitted to A/Ts on June 6, 2017

A/T Review Comments
on the
Draft Ballard Mine Shop Closure Memorandum (Revision 0, February 2017)

and P4's Responses

General Comments

A. This report presents recommended interim actions to protect workers while the shop area continues to be used, and a strategy for developing a final remedy that would be implemented at some point in the future. The A/T believes that this approach is reasonable under the circumstances. Under this approach, interim actions may be implemented in the near term, and a focused FS and ROD for the shop area deferred to a future date when the shop area is no longer in active use. The report should be revised to clarify the process, and to distinguish between the recommended elements that would be implemented in the near term, and strategy or plan for developing a focused FS. As a starting point, the title of the report should reflect that the document is plan describing recommended interim actions, and a strategy for developing final recommendations.

P4 Response (GC-A): *Your impressions of the document are correct. We do not believe that the final remedy for the Ballard Mine Shop Area can be completed at this time because this area of the Site will be used for a variety of purposes, potentially in excess of the Ballard Site remediation time frame. In addition, there are no immediate threats to human health or the environment posed by the Shop Area. As a result, we see the Ballard Shop Area closure as a two-step process that includes interim measures implemented to protect worker and public safety as described in Section 3.0 while performing the overall Site Remedial Action (RA). Secondly, final investigation and closure of the Shop Area will be accomplished when the Site-wide RA is completed and activities performed at the Site have ceased as described in Section 4.0. At that time, a targeted investigation will be needed to confirm that soil and groundwater contamination is present and is still of concern (given the natural degradation process of hydrocarbons) and to potentially investigate other activities that were performed during the RA (e.g., the fuel storage area) following a visual survey and review of P4 records (as discussed in GC-C below). P4 has revised the introduction to this plan to explain this two-step process for Ballard Shop Area closure and edited Sections 3.0 and 4.0 of the current plan to convey this approach in writing. P4 does believe this is a closure memorandum or plan, but would value your suggestions as to a future title for the document.*

B. This report is informative, however, it is not a feasibility study nor does it consistently follow CERCLA RI/FS guidance. As such, it does not provide critical evaluation information about proposed alternatives (such as effectiveness, implementability and cost, or the rigors of applying NPL threshold and balancing criteria). Consistent with general comment A (above), in describing the strategy for developing a focused FS, include a description of the elements of a future focused FS.

P4 Response (GC-B): *Agreed. Given the current Site knowledge, and possible future operations at the Ballard Shop Area, a complete FS was not performed. As stated in response to GC-A, the memorandum has been revised to clarify the interim actions that will be implemented during the RA and to describe the elements that will be included in a future focused FS. The future focused FS, as stated above, will be prepared when the Site-wide RA is completed and/or activities performed at the Shop Area have ceased and the Shop Area has undergone a focused investigation. Once the nature and extent of the contamination is confirmed, a focused FS can be prepared for the Shop Area.*

C. References in the Ballard Mine FS Tech Memos indicate that remedial action at the Ballard shop would be deferred until the mine site is remediated. Institutional Controls (ICs) were recommended during this interim period to limit potential exposures until a focused FS is completed and the site can be remediated. The draft Ballard Mine Closure Memorandum reflects this approach. This memorandum does not provide nearly the level of detail in the alternatives, nor the evaluation and comparative analysis of alternatives against criteria, that is normally included in an FS. There are uncertainties not only with alternatives details, but also with site characterization in the Shop area. Uncertainties associated with site characterization include:

- The depth and areal extent of contaminated groundwater – there are only data from 3 temporary monitoring points (TMPs), one of which exhibited PCE above MCLs, plus 2 irrelevant monitoring wells (for delineation purposes) which are outside the flow path from the Shop. It is unknown whether contamination emanating from the Shop might occur in the hundreds of feet between the TMPs.

- Does contaminated soil and/or groundwater extend beneath the Shop slab. It would be somewhat surprising if there isn't, considering that the Shop contained a grease pit and floor drain.

- Whether there is any contamination that has or will occur due to leaks/spills/releases from existing fuel tank and explosives currently stored at the Shop area. It appears that the existing storage tanks may not have secondary containment, or containment pads for transfer of fuels.

Therefore, the strategy for developing a focused FS for the shop area should acknowledge and describe potential data gaps, and include plans or steps to address data gaps to clarify that the shop area would be subject to further characterization and a focused FS upon completion of the mine site remediation. At that time, use of, or decommissioning of, the shop would be clearer along with definitive remedial actions that could be successfully applied to final site conditions. At this time, too many uncertainties (as described above) exist for remediation of both Shop area soil and groundwater, which will not be resolved (because of its proposed use) until the remediation of the mine site is complete or nearing completion.

P4 Response (GC-C): *The last sentence of the comment sums up the situation well. In regard to groundwater, the report acknowledges the data gap under Interim Control Measures in Section 3.2, and furthermore a groundwater investigation is recommended. The specific text in Section 3.2 reads:*

"The LTM of all the P4 CERCLA Sites will continue and additional monitoring is recommended specifically in the Shop Area. Groundwater monitoring of TMPs SB-01, SB-03, SB-07, and MBW011 for VOCs/SVOCs should be conducted annually during the duration of the (Site-wide) RA. Prior to beginning this monitoring, it will be necessary to perform a direct-push investigation to better define if there is a groundwater plume in the Shop Area associated with SB-07, and to help determine the extent of the PCE. If the investigation findings warrant, it may be necessary to install additional permanent wells in strategic positions near the plume (e.g., the downgradient end of the plume)."

Similarly, additional characterization of the soil below the slab may be conducted before or during the Shop Area closure. This potential is addressed in Section 4.2, Soil Contingency. However, it does not address what will be done to investigate for potential soil contamination, only what would be done if it is found. The following has been added in Section 4.2:

"Prior to final Shop Area closure, the soil beneath the shop building slab may be investigated if it is determined by all parties to be necessary. This investigation may involve a systematic sampling of the underlying soils to the water table using soil borings if the pad is not demolished at closure, or test pits if the slab is removed and the underlying soils are exposed. Grab samples would be collected from any visible hot spots observed following slab removal (e.g., areas of staining)."

At this time, the potential contamination from ongoing use of the Shop Area obviously cannot be determined. An additional site assessment to address the current and future uses will have to be conducted prior to closure of the Shop Area as discussed in GC-A above. However, it should be noted that the current and future use of the Shop Area are under P4's stringent health and safety, and environmental reporting requirements as detailed in their contractor's Spill Prevention, Control, and Countermeasures Plan (SPCC Plan – Enoch Valley and Blackfoot Bridge Mines [Degerstrom, Inc., August, 2016]). As such, any significant spills of chemicals (e.g., fuel) will be documented, reported, and remediated if necessary under the requirement of ongoing operations. It also should be noted that the fuel farm at the Ballard Shop is underlain by a geosynthetic barrier, which precludes the downward migration of fuel spills. Text stating this has been added to the last paragraph of Section 1.1.

Specific Comments

Report

1. **Page 1-3, Section 1.1, last paragraph:** New fuel and explosive storage areas have been noted at the shop area. The plan indicates that a records review will be conducted to identify whether any spills have occurred. In addition to the records review it would be prudent to also conduct a visual survey of these areas to identify and document whether any soil staining is present that may require additional sampling.

P4 Response (SC-1): *Agreed. Such an assessment is standard procedure for closure of a site like the Shop Area under current programs. As noted in the GC-C response, the current and future use of the Shop Area will be under P4 Production's stringent health and safety, and environmental reporting requirements and as directed under their contractor's SPCC. As such, any significant spills of chemicals (e.g., fuel) will be documented, reported, and remediated, if necessary, under the requirement of ongoing operations. However, it is also prudent to indicate the suggested visual inspections in the memorandum. The relevant text in the last paragraph of Section 1.1 has been revised to the following:*

> *"As part of the final closure of the Shop Area, records for these new storage areas will be reviewed to assess if spills have occurred and measures that were taken to avoid environmental releases. In addition, upon removal of the structures, a visual assessment of the area will be conducted to identify potential areas of releases (e.g., soil staining). Depending on the record reviews and visual assessments, additional investigations may be necessary prior to closure of the Shop Area."*

2. **Page 1-3, Section 1.1, 3rd paragraph:** Given the presence of a new storage area with a wide variety of hydrocarbons (used oil, diesel/gasoline, bulk oil), it would advisable to sample beneath the concrete pad of these storage areas (used oil tanks, split tank, road diesel, and bulk oil trailer) prior to closures of the Shop Area to ensure total aromatic and aliphatic hydrocarbons in the soil are below the EPA's RSLs.

   P4 Response (SC-2): *As noted in SC-1, if there is an indication that contamination has occurred, then additional investigation (most likely soil sampling) would occur. Given P4's environmental safety and reporting requirements for the operating facility (e.g., in the SPCC), the records review, and visual assessments to be conducted at closure, P4 believes that committing to sampling of the areas discussed in this comment at closure is premature.*

3. **Page 1-4, Section 1.3.1**. Somewhere in this section, it should be acknowledged that there is a potential for contaminated soil to exist beneath the shop slab (considering that the shop contained a grease pit and floor drain), which has not yet been evaluated. This should be investigated (and risk re-evaluated) if/when the shop is demolished.

   P4 Response (SC-3): *Text has been added to indicate samples have not been collected beneath the Shop building slab. Due to the low-level soil concentrations (currently below EPA RSLs) around the exterior and limited groundwater detections, it is not suspected that significant contamination exists beneath the building. Please see the GC-C response where new text in the memorandum is proposed regarding additional investigations. If the Shop building is demolished, then a visual assessment would first be performed. An appropriate response would be developed if the presence and extent of contamination is confirmed (e.g., additional investigation followed by evaluation and consideration of the findings in a focused FS).*

4. **Page 1-5, Section 1.3.1, first paragraph, last sentence.** Add text indicating that the detected levels of MEK are below relevant risk screening levels.

   P4 Response (SC-4): *Agreed. The sentence has been revised to read:*

   > ***"****The compound 2-butanone (MEK) also was detected in the 22 to 23-foot bgs sample of SB-03 at a low concentration (12.1 µg/kg). This concentration is several orders of magnitude below screening levels."*

5. **Page 1-5, Section 1.3.1, last paragraph.** It is indicated that PCBs were evaluated and not detected above the Reporting Limits (RLs). It is recommended that a statement be added to the risk summary section that describes whether any RLs for non-detected constituents at the Ballard Shop were above their respective screening levels. This will help the reader understand this potential uncertainty in the risk findings.

   P4 Response (SC-5): *The PCB laboratory RLs and screening levels were evaluated in the Ballard Shop Investigation Sampling and Analysis Plan included as Appendix D-2 of the P4 Site RI/FS Work Plan, Final, Revision 2, May 2011 and the Ballard Shop Area Investigation Technical Memorandum included as Appendix B of the Ballard Mine RI Report, Final, Revision 2, November 2014 (Ballard RI Report). The laboratory reported RLs for all samples as documented in the Technical Memorandum (MWH, 2014) are well below the screening levels. This statement has been included in the last paragraph of Section 1.3.1.*

6. **Page 1-5, Section 1.3.1, 3rd paragraph**; Based on Table 1-1 it appears that there were other VOCs detected above the RL in borings SB-08, SB-09, and SB-10 in addition to the ones listed (e.g., cis-1,2-dichloroethene, naphthalene in SB-08; 1,1-dichloroethane, cis-1,2-dichloroethene, isopropylbenzene, naphthalene, and sec-butylbenzene in SB-09; 2-butanone (MEK), acetone, and cis-1,2-dichloroethene in SB10). Revise accordingly

   P4 Response (SC-6): *The text has been revised as follows:*

   > *Several VOCs were detected including the following subset: 1,2,4- trimethylbenzene, 1,3,5-trimethylbenzene, xylenes, ethylbenzene, n-butylbenzene, n-propylbenzene, and p-isopropyltoluene.*

7. **Page 1-6, Soil Risk Summary, Human Health Risk section**. Does this mean that naphthalene and 1,2,4-Trimeythlbenzene (TMB) are in fact soil COCs, but do not warrant consideration when evaluating soil remedial technologies and alternatives because (a) residential land use is unlikely, and (b) they were only found at isolated spots and at relatively low levels? Does this mean that ICs/LUCs are needed to prevent future residential use? Please clarify.

   P4 Response (SC-7): *Yes, although both naphthalene and 1,2,4-Trimethylbenzene were considered preliminary COCs based on risk estimates in the BRA, they were not considered in evaluating remedial actions. This was due to their low detection frequency and low detected concentrations (naphthalene was detected above, but close to, its RSL in one sample only, and 1,2,4-trimethylbenzene was detected below its RSL in all samples, and above 1/10th of it's RSL in one sample only). As stated in the third bullet on page 1-6:*

   > *"Given the land ownership and industrial nature of the Shop Area, and its continued industrial land use to support P4 mining operations, the potential for residential land use is unlikely to occur. As a result of the land use, isolated low-level detections, and low hypothetical future residential risk estimates, no organic COCs in soil warrant consideration in the brief evaluation of technologies and alternatives discussed in Section 2.0."*

   Additional discussion of residential ICs/LUCs has been included in Section 3.0 to address this concern.

8. **Page 1-6, Section 1.3.1, Bullet 1:** Indicate the following: a) methodology used for the calculation of the risk (i.e., use of any software application) b) citation of the risk calculations, if there is not a document with the calculations mentioned in Table 1-2, include these calculations as an appendix of this document.

   P4 Response (SC-8): *Risks associated with organics in media at the Ballard Shop Area were calculated and documented in the Baseline Risk Assessment (BRA), provided as Appendix A of the Ballard RI Report. This citation has been included in the Soil Risk Summary of Section 1.3.1.*

9. **Page 1-6, Soil Risk Summary, Risk to the Environment section**. Does this mean that 1,2,4-TMB is in fact a soil COEC, but does not warrant consideration when evaluating soil remedial technologies and alternatives because it was only found at one isolated spot?

   P4 Response (SC-9): *Correct; although 1,2,4-trimethylbenzene was identified as a COEC based on the results of the ecological risk evaluation for the Ballard Shop Area, it was not considered in the evaluation of remedial actions. It was detected only once, in a sample collected from 5 to 6 feet below ground surface, and the ecological hazard associated with this detected concentration was relatively low. Additionally, although a burrowing animal such as a deer mouse might encounter subsurface soil at a depth of 5 to 6 feet below ground surface, such exposure is likely to be less common than surface exposures.*

10. **Page 1-7, Section 1.3.2, first paragraph.** Did the HHRA for the P4 Plant Site include evaluation of both chemical and radiological exposures? Additional discussion that further describes the exposures evaluated at the P4 Plant Site is necessary to confirm that the findings from that evaluation are representative of exposures identified as complete in the Ballard Mine CSM.

    P4 Response (SC-10): *Yes. The HHRA for the P4 Plant Site included evaluation of both chemical and radiological exposures to on-site industrial workers. Specifically, the Plant Site HHRA evaluated current and future industrial worker exposure via incidental ingestion, external radiation, and inhalation. This information has been incorporated into Section 1.3.2 text.*

11. **Page 1-7, Section 1.3.3, Groundwater Nature and Extent and Risk Summary:** Similar to the comment above on soil nature and extent, somewhere in this section it should be acknowledged that there is a potential for contaminated groundwater to exist beneath the shop slab (considering that the shop contained a grease pit and floor drain), which has not yet been evaluated, and that this should be investigated (and risk re-evaluated) if/when the shop is demolished. Also, monitoring at only the three temporary monitoring points (TMPs) used to investigate groundwater around the shop building does not seem entirely adequate to determine if there is contamination emanating from the shop, particularly given that PCE was detected at SB-07. Is any more investigation planned to investigate/delineate groundwater contamination? If not, suggest that this be included in groundwater Alts 2 and 3.

    P4 Response (SC-11): *As described in Response GC-C, there already is specific text in Section 3.2 that recommends further groundwater investigation in the Shop Area to delineate the potential plume. In addition to that text, the following has been added in Section 1.3.3. under the Groundwater Risks Summary subheading, at the end of the first bullet:*

"In addition, it should be noted that further groundwater characterization is likely needed prior to closure to further characterize the potential for a plume associated with the concentrations observed at the SB-07 location. At a minimum, this characterization would be needed to help ensure proper monitoring of the groundwater below the Ballard Shop Area. However, if significant additional contamination is found, additional analysis of risk and alternatives may be needed."

12. **Pages 1-7 and 1-8, Section 1.3.3, Groundwater Nature and Extent and Risk Summary:** Groundwater flow direction was determined to be southwest to west-southwest. Please identify the depth to the first water bearing unit and fully define the lateral extent of the PCE plume.

    P4 Response (SC-12): *The depth to water downgradient of the Shop Area is approximately 30 to 35 feet below the ground surface. The lateral extent of any plume near the shop is assumed to be less than the width of the shop building. However, downgradient of the shop building the lateral and longitudinal extent has not been defined. The depth to groundwater has been added in the first paragraph of Section 1.3.3. It has also been noted that the extent of PCE concentrations above the MCL near boring SB-07 have not been defined at the end of the first complete paragraph on Page 1-8.*

13. **Page 1-8, Groundwater Risks Summary section**. Should the bold title "Risk to Human Health" appear in the 1st bullet (rather than the 2nd) indicating that it applies to both bullets 1 and 2? Does the text in these two bullets mean that PCE is in fact a groundwater COC? Does this mean that ICs are needed to prevent residential land use or well installation?

    P4 Response (SC-13): *Evaluation of groundwater risks and COCs for the Ballard Shop Area was completed using the same methods as groundwater COCs proposed for the Site in Ballard FS Memo #1. A constituent can become a groundwater COC either by excess risk as determined in the BRA or by an exceedance of ARARs. PCE in groundwater did not contribute to excess risk in the BRA, but it does exceed the MCL. As a result, PCE is considered a COC for the Shop Area. A bold title "**Exceedances of Chemical-Specific ARARs**" has been included in bullet #1. ICs for Ballard Shop groundwater, specifically for PCE, are addressed in the second bullet of Section 3.2 Interim Control Measures.*

14. **Page 2-1, Section 2.1, 1st paragraph:** The reader is directed to the *Ballard FS Memo #1* for a list of applicable RAOs. Since this closure memo will likely become an attachment to Ballard FS Memo #2, please include a table with applicable RAOs to make it a more comprehensive document.

    P4 Response (SC-14): *As this document is being revised to highlight interim measures, inclusion of RAOs are not necessary at this time. RAOs for the Shop Area will be included in the Focused FS and will be similar to the RAOs for the Ballard Site in FS Memorandum #1 (MWH, 2016).*

15. **Page 2-1, 3rd paragraph (after first 3 bullets)**. The sentence "The Shop Area GRAs were developed specifically for the COCs/COECs identified in Section 1.3" is confusing with respect to other document text. It is not clear what constituents, if any, were identified as COCs/COECs in Section 1.3, and the Soil Risk Summary portion of Section 1.3 states that no organic COCs or COECs in soil warrant consideration in the evaluation of technologies and alternatives. Accordingly, Alt 3 focusses on potential future use of technologies to remove contaminants that may be found under the slab, not COCs/COECs identified in prior investigations (and described in Section 1.3). Please clarify.

P4 Response (SC-15): *The text in Section 2.0 including the discussion of soil GRAs has been revised to reflect the interim nature of this document and that the GRAs are preliminary until the Shop Area is no longer actively used, an investigation is performed, and a focused FS is prepared.*

16. **Page 2-2, Section 2.2.1, second paragraph.** Needs editorial attention.

    P4 Response (SC-16): *Agreed. The paragraph was written one long run on sentence. This has been corrected.*

17. **Page 2-2, Section 2.2, Soil Technology Review and Closure Alternative Development:** Alternative screening was not performed in accordance with EPA RI/FS guidance. A future focused FS must evaluate alternatives using the NPL criteria. The reader was also left to ponder whether building slabs would be removed and potentially contaminated soils exposed. No details with respect to volume estimates of soils to be removed, repository destinations, or haulage distance for clean borrow material were provided for cost estimating. (detailed information was also lacking for potential groundwater remediation – see Section 2.3)

    P4 Response (SC-17): *See response to GC-A.*

18. **Page 2-2. Section 2.2.2 (Alternative 2)**. Agree that this is a viable alternative, but it is very non-specific and hypothetical as currently described. Describe in more detail what ICs/LUCs would likely be included in this alternative.

    P4 Response (SC-18): *See response to GC-A. In addition, more detail on potential future ICs/LUCs has been included for the alternatives discussed in Section 3.0.*

19. **Pages 2-3 through 2-6. General comment on groundwater alternatives**. Is there also the potential to encounter contaminated groundwater beneath the shop slab in the event that the shop is demolished, similar to the potential for soil contamination considered in the soil alts? If so, the groundwater alternatives should be addressed in a manner consistent with the soil alternatives.

    P4 Response (SC-19): *As noted in Response GC-C, further groundwater characterization is likely needed in the Shop Area. Given the probable age of the potential plume (tens of years old), it is unlikely that groundwater contamination exists only under the Shop building. In fact, because the potential source was removed (vehicle maintenance activities ended in 1989), any contamination could be completely dispersed or degraded beneath the building, and only exist in the downgradient area. However, this possibility has been addressed in the groundwater alternative similar to soils.*

20. **Page 2-5, Section 2.3.3 (Alt 3), bullet list of in-situ technologies**. Air sparging, with or without Soil Vapor Extraction, may be an additional, potentially-viable technology for chlorinated VOCs in groundwater.

    P4 Response (SC-20): *A discussion of air sparging with or without SVE has been added to the text. It was originally excluded, because the heterogeneous and stratified alluvial section, with everything from gravel to abundant clay beds, is not geologically favorable for air sparging. A statement reflecting this limitation for air sparing/SVE has been added to the text of Section 2.3.3.*

21. **Page 3-1, Section 3.0**. It appears that the term "Remedial Action" here refers to the entire Ballard Site RA, and not just the Shop RA. This becomes evident later, but suggest making it clear up-front.

P4 Response (SC-21): *Agreed. The sentence with the first occurrence of RA has been rewritten to read:*

> *"During the Ballard Site-wide RA, uses for the Shop Area will be similar, but the scale of these activities will increase dramatically."*

22. **Page 4-1, Section 4.2, Groundwater**. Recommend a Groundwater Contingency section be added, analogous to the Soil Contingency section, to discuss contingencies in the event that further groundwater contamination above acceptable levels were to be found, e.g., during supplemental groundwater investigation efforts around the shop, or beneath the slab after shop demolition?

P4 Response (SC-22): *Agreed. A Groundwater Contingency section has been added to Section 4.2. The contingency involves further MNA evaluation to address new concentration levels or extent. However, it also includes a provision for further evaluation of technologies if unanticipated COCs are identified that have previously not been evaluated.*

Ballard Mine Shop Closure Report
(January 2017)

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
1	**Acronyms and Abbreviations**	**ii**			Delete "DOI Department of the Interior" as it is not used after it is defined in the text.	
2	**1.0**	**1-1**	**Bullet 2**	**1**	Delete "that" to read "… possible alternatives for the …"	
3	**1.0**	**1-1**	**Bullet 3**	**2**	Put a period after "period" for consistency.	
4	**1.0**	**1-1**	**3**	**7**	Delete "(DOI)" as it is not used after this occurrence.	
5	**1.1**	**1-2**	**2**	**5**	Change "south west" to "southwest."	
6	**1.1**	**1-3**	**1**	**1**	Delete the first "also" to read "Crushed slag has also been stockpiled …"	
7	**1.1**	**1-3**	**2**	**5**	Change "was" to "were" to read "The Shop building and immediate area were used …" for subject-verb agreement.	
9	**1.3.1**	**1-5**	**2**	**3**	It appears that the depth for the soil sample with concentrations above the RL at SB-04 was "10 to 11-foot bgs" not "8 to 9-foot bgs." Revise accordingly.	
11	**1.3.1**	**1-5**	**3**	**4**	Change to "n-propylbenzene" for consistency.	
13	**1.3.1**	**1-6**	**Bullet 2**	**4**	Delete the 2nd "y" to read "1,2,4-trimethylbenzene."	
14	**1.3.1**	**1-6**	**Bullet 2**	**8**	Table 1-1 states that the screening level of 1,2,4-Trimethylbenzene is 58,000 µg/kg not 62,000 µg/kg. Clarify or revise accordingly.	
15	**1.3.1**	**1-6**	**Bullet 2**	**9 (last)**	Delete the 2nd "y" to read "1,2,4-trimethylbenzene."	
16	**1.3.1**	**1-6**	**Bullet 4**	**3 & 4**	Indicate which other indicator species had an HQ estimate below 1 and cite the document where these calculations were made.	
17	1.3.3	1-8	2	3	The text states: "Only 1,1,1-trichloroethane (1,1,1-TCA in SB-03)…" For consistency add to Table 1-3 the same nomenclature: 1,1,1-trichloroethane (TCA).	

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
18	1.3.3	1-8	3	3	The screening value for bis(2-ethylhexyl) phthalate does not match with the screening value mentioned in Table 1-3. Revise accordingly.	
19	1.3.3	1-8	3	7	Insert a space to read "bis(2-ethylhexyl) phthalate" for consistency.	
20	2.2	2-2	2	3	Insert a comma to read "technologies, and the alternatives …" for consistency.	
21	2.2.3	2-3	3	Sentence 7 (last)	Include an avian nest clearance survey under this alternative.	
22	2.3	2-4	Bullet 1		Was this determination made also for livestock and wildlife? If so, include this information in this section of the document. If not the document needs to state that the potential risk to PCE to wildlife has not been determined and the likelihood of PCE to contaminate springs, ponds or wildlife water sources around the Shop area.	
23	3.1	3-1	1	2	Insert "for" twice and change to "infrequently" to read "… for fuel storage and fueling, and infrequently for other activities …"	
24	3.1	3-1	1	7	Insert "for" to read "… and for likely continued …"	
25	3.1	3-1	2	2	Change "facilities" to "facilities'."	
26	5.0	5-1	Ankrum citation		Change the period to a comma to read "Ankrum, Keith, 1992. …" for consistency.	
27	Table 1-1	2 of 2	Notes		The footnotes should indicate that the USEPA RSLs for Chemical Contaminants at Superfund Sites Residential Soil (USEPA, 2016) correspond to HQ=1 and TR= 1E-06.	
28	Table 1-1	2 of 2	Notes		Add "**Bold** Bolded result indicates positively identified compound."	
29	Table 1-1	2 of 2	Notes		Change to "*Italic* Italicized result indicates analyte reported to the method detection limit."	

Editorial Comments

Item No.	Section; Table; Figure	Page	Paragraph	Line (if not obvious)	Agency/Tribe Comments	Did P4 Respond to Comment
	Table 1-1				Revise “m,p-Xylene (Sum of lisomers)” to read “m,p-Xylene (Sum of isomers)”	

P4 Response (editorial comments): *These editorial comments have been addressed in the revised report.*

APPENDIX A-3

A/T Additional Comments on P4 Response to Comments (dated June 6, 2017) on *P4's Ballard Mine Shop Closure Memorandum, Draft Revision 0, February 2017*

Submitted to P4 on January 31, 2018

From: Drain, Vance [mailto:vance.drain@stantec.com]
Sent: Wednesday, January 31, 2018 12:08 PM
To: Tomten, Dave <Tomten.Dave@epa.gov>; MOLLY PRICKETT - P4 Monsanto (molly.prickett@monsanto.com) <molly.prickett@monsanto.com>
Cc: Mike Rowe <michael.rowe@deq.idaho.gov>; Norka Paden (Norka.Paden@deq.idaho.gov) <Norka.Paden@deq.idaho.gov>; Dennis Smith (dennis.smith2@ch2m.com) <dennis.smith2@ch2m.com>; Leah Wolf-Martin (leah@wolfmartininc.com) <leah@wolfmartininc.com>; Bruce Narloch <Bruce.A.Narloch@mwhglobal.com>; Kaminski, Laurel <laurel.kaminski@stantec.com>
Subject: FW: Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017) - RESPONSES TO 2 REMAINING A/T COMMENTS

Dave,
Please read Leah's email to me below. These responses attempt to answer the questions that were posed by IDEQ.
Thank you,
Vance

From: Leah Wolf Martin [mailto:leah@wolfmartininc.com]
Sent: Wednesday, January 31, 2018 11:57 AM
To: Drain, Vance <vance.drain@stantec.com>; 'Cary Foulk' <cfoulk@integrated-geosolutions.com>
Cc: Narloch, Bruce <bruce.narloch@stantec.com>; Kaminski, Laurel <laurel.kaminski@stantec.com>
Subject: RE: Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

Vance,

The two comments that the A/Ts are requesting clarification on were included within the "editorial comments", and therefore we did not provide an RTC in our June 6, 2017 RTC submittal. Obviously as we addressed the editorial comments, we realized they were not editorial in nature but RTCs had been submitted (6/6/17). Laurel has already weighed in on these and we have addressed them in the redline line text in the Revised Ballard Shop Closure Memo (that hasn't been submitted to the A/Ts). See our draft response to each below:

A/T Editorial comment #16: Indicate which other indicator species had an HQ estimate below 1 and cite the document where these calculations were made.

P4 Response: The other indicator species with an HQ estimate below 1 were the American Goldfinch, American Robin, and Deer Mouse. These calculations were made and presented in the *Baseline Risk Assessment* (*BRA) Report for the Ballard Mine and Ballard Shop*, which is Appendix A of the *Ballard Mine RI Report Final Revision 2* (MWH, 2014). This information will be included in the revised *Ballard Shop Closure Memorandum*.

A/T Editorial comment #22: Was this determination made also for livestock and wildlife? If so, include this information in this section of the document. If not the document needs to state that the potential risk to PCE to wildlife has not been determined and the likelihood of PCE to contaminate springs, ponds or wildlife water sources around the Shop area.

P4 Response: The determination for potential risks to the environment was not completed for any ecological receptors including livestock and wildlife because as stated in the *Draft Ballard Shop Closure Memorandum* and the *Ballard BRA*, the groundwater pathway is incomplete for ecological receptors in the Ballard Shop Area. There is no groundwater discharge to streams, springs, or ponds that could serve as livestock of wildlife water sources in the vicinity of the Shop Area. This will be further clarified in the revised *Ballard Shop Closure Memorandum*.

Please make any edits or let me know if you have any questions.

Thanks,

Leah

From: Tomten, Dave [mailto:Tomten.Dave@epa.gov]
Sent: Wednesday, January 31, 2018 11:12 AM
To: PRICKETT, MOLLY [AG/1850] <molly.prickett@monsanto.com>; Drain, Vance <vance.drain@stantec.com>
Cc: Michael Rowe <Michael.Rowe@deq.idaho.gov>; Dennis Smith <Dennis.smith2@ch2m.com>; Norka Paden (Norka.Paden@deq.idaho.gov) <Norka.Paden@deq.idaho.gov>
Subject: Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

Molly –
This follows up on the Ballard Shop Closure Memorandum. As you'll recall, you submitted an initial draft of this document on February 3, 2017. I provided the A/T's comments to you on April 20, 2017, and P4 provided RTCs on June 6, 2018. I then set this task aside to focus on some higher priority work, and am finally circling back so that we can finalize this deliverable in advance of issuing the proposed plan.

The A/T have reviewed the RTCs. Most of the comments have been resolved to the A/T's satisfaction. There are two comments (see thread below) from the table of comments where we are requesting additional clarification prior to P4 issuing a revised report. Can you please take a look at these two comments, and provide clarification via e-mail? If there are any additional questions about these two items, we can schedule a brief call to discuss.

Please call if you have any questions. Thank you.
Dave

_____
Dave Tomten
EPA Region 10
950 W. Bannock Street
Suite 900
Boise, Idaho 83702

208-378-5763
tomten.dave@epa.gov

From: Michael.Rowe@deq.idaho.gov [mailto:Michael.Rowe@deq.idaho.gov]
Sent: Wednesday, July 05, 2017 9:30 AM
To: Tomten, Dave <Tomten.Dave@epa.gov>
Cc: dennis.smith2@ch2m.com; Norka.Paden@deq.idaho.gov
Subject: RE: P4's Responses to A/T comment on the Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

Dave,

Here are the two comments Norka would like to see more clarification, i.e., an actual response.

Ballard Mine Shop Closure Memorandum (February 2017)	
	Agency/Tribes Comment
Specific Comments	
Indicate which other indicator species had an HQ estimate below 1 and cite the document where these calculations were made.	
Was this determination made also for livestock and wildlife? If so, include this information in this section of the document. If not the document needs to s PCE to wildlife has not been determined and the likelihood of PCE to contaminate springs, ponds or wildlife water sources around the Shop area.	

Thanks,
Mike

From: Michael Rowe
Sent: Wednesday, July 05, 2017 8:53 AM
To: 'Tomten, Dave'
Cc: Dennis Smith (dennis.smith2@ch2m.com) (dennis.smith2@ch2m.com); Norka Paden
Subject: RE: P4's Responses to A/T comment on the Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

Dave,

Per my comment below about not all of the IDEQ comments in the "Editorial Comments" table being editorial in nature, many of these comments were Norka's. She does not feel that they have been adequately addressed and she would at least like to see what their response will be prior to seeing the next draft of the document. What do you suggest?

Mike

From: Michael Rowe
Sent: Friday, June 16, 2017 9:23 AM
To: 'Tomten, Dave'
Cc: Dennis Smith (dennis.smith2@ch2m.com) (dennis.smith2@ch2m.com); Norka Paden
Subject: RE: P4's Responses to A/T comment on the Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

Dave,

The responses appear adequate to me although several of the IDEQ comments were from Norka and she should weigh in on whether the responses to her comments were satisfactory. I am curious as to their responses to all the comments at the end of the comments. All of these are IDEQ comments, but not all of them are editorial in nature.

Mike

From: Tomten, Dave [mailto:Tomten.Dave@epa.gov]
Sent: Monday, June 12, 2017 10:02 AM
To: Bruce Olenick; Colleen O'Hara-Epperly (cohara@blm.gov); Dennis Smith (dennis.smith2@ch2m.com); Gary Billman; Jeff Cundick; Jeff Schut; Jeremy Moore (jeremy_n_moore@fws.gov); Kelly Wright; Michael Rowe; Norka Paden; Sandi

Fisher; Shannon Leigh Ansley (sansley@sbtribes.com); Shephard, Burt; Stifelman, Marc; Stumbo, Sherri A -FS; susanh@ida.net; Tomten, Dave; Trina Burgin; Wallace, Joe
Subject: FW: P4's Responses to A/T comment on the Draft Ballard Shop Closure Memorandum (Rev 0, Feb 2017)

All –
Attached are P4's responses to comments on the Ballard Shop Closure memo. Please look this over and let me know if you have any concerns. The target date for comments is June 26.
Thanks.
Dave